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JANUARY 1944

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ECHNICAL ERROR

BY HAL CLEMENT

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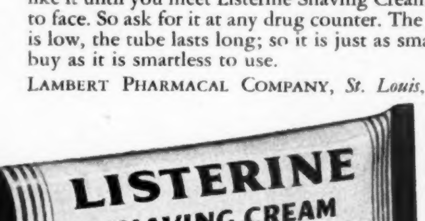

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Editor
JOHN W. CAMPBELL, JR.

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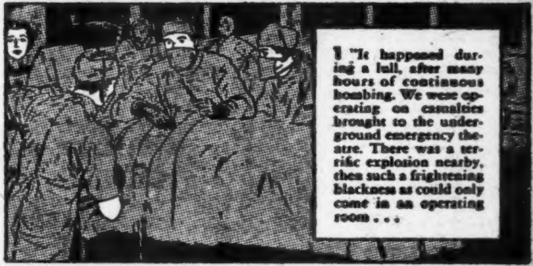
$2.50 per Year in U. S. A. Printed in the U. S. A. 25c per Copy

NEXT ISSUE ON SALE JANUARY 14, 1944

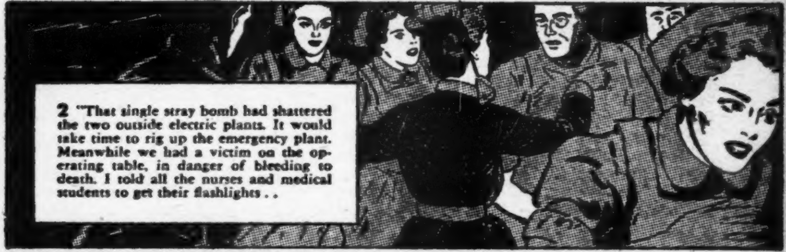
BLACKOUT IN THE OPERATING ROOM!

A true story of the war, as told by SISTER ISABEL NIXON, *Head Nurse of St. Thomas Hospital, London*, to a war correspondent.

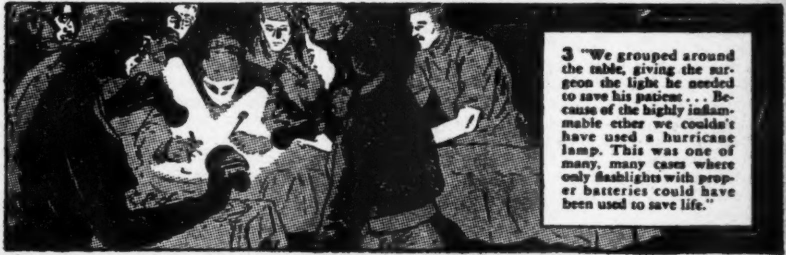
The centuries-old London hospital has three distinctions. It is London's most bombed hospital (undoubtedly because of its proximity to the Houses of Parliament just across the Thames). It has not during this war lost an air raid victim. And it was the home of Florence Nightingale. Headnurses still wear the same uniform and lace-edged frilled bonnets pioneer Nightingale wore during the Crimean campaign.



1 "It happened during a lull, after many hours of continuous bombing. We were operating on casualties brought to the underground emergency theatre. There was a terrific explosion nearby, then such a frightening blackness as could only come in an operating room . . .



2 "That single stray bomb had shattered the two outside electric plants. It would take time to rig up the emergency plant. Meanwhile we had a victim on the operating table, in danger of bleeding to death. I told all the nurses and medical students to get their flashlights . .



3 "We grouped around the table, giving the surgeon the light he needed to save his patient . . . Because of the highly inflammable ether we couldn't have used a hurricane lamp. This was one of many, many cases where only flashlights with proper batteries could have been used to save life."

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Soft-boiled

THERE are numerous shrouded hints to the effect that, in the golden days of the Post-war World, we won't do our cooking in the old, sloppy ways—that electronic heat will take over the job of the gas flame and the resistance wire. Personally, I doubt it. Hard-boiled eggs serve admirably in picnic sandwiches, certain salads, and for Easter-egg dyeing, but I don't like hard-boiled eggs. Now the essence of electronic heating is the uniform, through-and-through generation of heat within the mass being heated; it would hard-boil an egg perfectly in a few seconds—but it won't soft-boil an egg. A soft-boiled egg gets that way by reason of the fact that the heat conductivity of an egg being rather low, the outer layers are coagulated before the inner portions have been more than nicely warmed.

And you may like your steak or your roast beef—this, remember, concerns a later time, when such things are to be had—rare—but that means rare on the inside, not in a condition that suggests it will moo if you start to carve it.

Curiously, electronic methods are being applied in metallurgical work to do precisely that sort of non-uniform "cooking." While a gas flame and a pot of water does a very fine job of soft-boiling an egg, gas heat hasn't been able to do a similar job for steel. "Soft-boiled" steel—in the sense that is meant here, at least—is, like a soft-boiled egg, coagulated, hardened, in the outer layers, but still soft—and, therefore, tough—on the inside. The accomplishment of this trick requires, as in the case of the soft-boiled egg, that the outer surface of the steel reach "coagulation"—tempering, in this case—heat while the interior is only mildly warmed, or still cold. It's really an astonishingly close parallel to the problem of soft-boiling an egg—the end result desired is the same, and the method of attainment—temperature distribution—is the same. But the practical methods of achieving that temperature distribution are opposite.

Gas heat will not soft-boil steel; the metal is a much better conductor of heat than gas, so that the heat is conducted from the surface to the interior of the metal faster than the hot gas can bring it to the surface. (Hot water can bring heat to the egg faster than the egg can transfer it inward.) To get the surface-hardening wanted, a means of feeding heat into the surface, *and the surface only*, at any desired rate—and an extremely high rate indeed was desired—was needed.

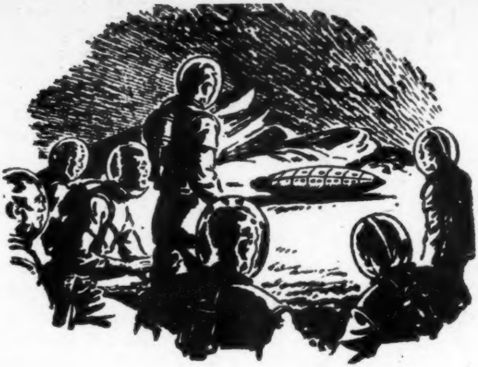
The whole mass can be heated at any desired rate by running a sufficiently powerful electric current through it. Two tricks can be used to make that current run in the surface layers only—high-frequency currents produce magnetic effects in any conductor, steel, copper or aluminum equally, which tend to make the current repel itself, seek pathways as far apart as possible. A real problem in radio work, this effect makes a one-inch-thick solid copper bar have a greater resistance than a thin copper foil wrapped around a two-inch nonconductive rod. If a very powerful high-frequency current is sent through a steel rod, all the current, and hence all the heating, will appear in the surface layers. Presto! Soft-boiled steel. Quick-acting, rapid processes are highly desirable these days; this trick not only can be, but has to be extremely fast. The outer layers are heated to red heat, and the current cut off so quickly that the interior remains entirely cold.

The heat-and-chill cycle is, of course, the old stand-by of tempering steel. The result is a glass-hard bearing surface, while a tough, malleable interior remains.

The other trick for surface heating also depends on making electrical resistance heating do the job—the only way you can feed energy into metal faster than it can be distributed. But this method involves inducing local currents, in circumscribed areas, rather than feeding current in from outside. High-frequency magnetic fields do the trick; the induced currents set up in the surface of the metal simultaneously block the penetration of the magnetic field, preventing deep heating, and heat the metal in which they flow.

Those electronic cooking methods do a wonderful job of soft-boiling steel—but they can't make me eat hard-boiled eggs. I'll stick to boiling water and a gas flame.

THE EDITOR.



Technical Error

by Hal Clement

***The** ship had been built by aliens—and though the basic principles of engineering held, their "know-how" methods were utterly—disastrously!—different.*

Illustrated by Orban

SEVEN spacesuited human beings stood motionless, at the edge of the little valley. Around them was a bare, jagged plain of basalt, lit sharply by the distant sun and unwavering stars; a dozen miles behind, hidden by the abrupt curvature of the asteroid's surface, was a half-fused heap of metal that had brought them here; and in front of them, almost at their feet, in the shallow groove scraped by a meteor ages before, was an object which caused more than one of those men to doubt his sanity.

Before them lay the ship whose heat-ruined wreckage had been left behind them only minutes ago—perfectly whole in every part. Seven pairs of eyes swept it from end to end, picking out and recognizing each line. Driving and steering jet pits at each end; six bulging observations ports around its middle; rows of smaller ports, their transparent panes gleaming, obviously intact, in the sunlight; the silvery, prolate hull itself—all forced themselves on the minds that sought desperately to reject them as impossibilities. The *Giansar* was gone—they had fled from the threat of its disordered atomic engines, watched it glow and melt and finally cool again, a nearly formless heap of slag. So what was this?

None of them even thought of a sister ship. The *Giansar* had none. Spaceships are not mass production articles; only a few hundred exist as yet, and each of those is a specialized, designed-to-order machine. A spaceman of any standing can recognize at a glance, by shape alone, any ship built on Earth—and no other intelligent race than man inhabits Sol's system.

Grant was the first to throw off the spell. He glanced up at the stars overhead, and figured; then he shook his head.

"We haven't circled, I'll swear," he said after a moment. "We're a quarter of the way around this world from where we left the ship, if I have allowed right for rotation. Besides, it wasn't in a valley."

The tension vanished as though someone had snapped a switch. "That's right," grunted Cray, the stocky engine man. "The place was practically flat, except for a lot of spiky rocks. And anyway, no one but a nut could think that was the *Giansar,* after leaving her the way we did. I wonder who left this buggy here."

"Why do you assume it has been left?" The query came, in a quiet voice, from Jack Preble, the youngest person present. "It appears uninjured. I see no reason to suppose that the crew is not waiting for us to enter at this moment, if they have seen us."

Grant shook his head. "That ship might have been here for years—probably has, since none of us can place it. The crew may be there, but, I fear, not alive. It seems unlikely that this craft has been registered in the lifetime of any of us. I doubt that it would have remained here unless it were disabled; but you must all have realized by now that it holds probably our only chance of life. Even if it won't fly, there may be a transmitter in repair. We would better investigate."

The men followed the captain as he took a long, slow leap down the slope. Little enthusiasm showed in the faces behind the helmet masks; even young Preble had accepted the fact that death was almost inevitable. At another time, they might have been eager and curious, even in the face of a spectacle as depressing as a derelict usually is; now they merely followed silently. Here, probably, a similar group of men had, no one knew how long ago, faced a fate identical to theirs; and they were about to see what had befallen those others. No one saw humor in the situation, but a wry smile was twisting more than one face as the group stopped beneath the circular entrance port. More than one thought of the possible irony of their being taken for a rescue crew.

Grant looked at the port, twenty-five feet above their heads. Any of them could easily have jumped to it; but even that effort was not necessary, for a row of niches, eight inches square and two deep, provided a ladder to the rim. It was possible to cling to them even on the lower curve of the hull, for they were deeply grooved around the inside edges. The captain found that his gauntlets could grip easily, and he made his way up the wall of metal, the others watching from below. Arriving at the port, he found that the niches formed a circle around it, and other rows of them extended over the hull in different directions. It was at the entrance, however, that he met the first of the many irregularities.

The others saw him reach the port, and stop as though looking around. Then he traveled entirely around it, stopped again, and began feeling the mirrorlike metal with his gloved hands. Finally he called out:

"Cray, could you come up here, please? If anyone can find the opening mechanism, you should."

The engineer remained exactly where he was.

"Why should there be any?" he asked. "The only reason we use it on our ships is habit; if the door opens inward, atmospheric pressure will hold it better than any lock. Try pushing; if the inner door is sealed, you shouldn't have much trouble—the lock chamber will be exhausted, probably."

Grant got a grip near the edge of the door, and pushed. There was no result. He moved part way around the rim and tried again, with the same lack of success. After testing at several more points, he spoke again:

"No luck. I can't even tell which side the hinge is on, or even if there is a hinge. Cray, you and a couple of others had better come up and give a hand at pushing; maybe there's a trace of air in the inner chamber."

Cray grunted, "If there's anywhere near an atmosphere's pressure, it'll take tons to budge the door—it's twelve feet across." But this time he began to climb the hull. Royden, probably the most powerful one present, and a chemist named Stevenson followed him. The four men grouped themselves about the forward edge of the port, their feet braced on the door itself and hands firmly gripping the climbing niches; and all four tensed their bodies and heaved. The door still refused to budge. They rested a moment, and followed Grant to the opposite side of the metal disk.

This time their efforts produced results. The pressure on the other side of the valve must have been only a few millimeters of mercury; enough to give four or five hundred pounds' resistance to an outside thrust at the edge opposite the hinge. When the door opened a crack, that pressure vanished almost instantly, and the four men shot feet first through the suddenly yawning opening. Grant and Stevenson checked the plunge by catching the edge of the port frame; the other two disappeared into the inner darkness, and an instant later the shock of their impact upon some hard surface was felt by those touching the hull.

The captain and the chemist dropped to the floor of the lock and entered; Preble leaped for the open door, followed by Sorrel and McEachern. All three judged accurately, sailing through the opening, checking their flight against the ceiling, and landing feet down on the floor, where they found the others standing with belt lights in their hands. The sun was on the far side of the ship, and the chamber was lighted dimly by reflection from the rocks outside; but the corridors of the vessel themselves must be dark.

The inner valve of the air lock was open—and had apparently been so from the beginning. Cray and Royden had shot through it, and brought up against the farther wall of a corridor running parallel to the ship's long axis. They were both visible, standing back to back, sweeping the corridor in both directions with their lights. Grant took a step that carried him over to them, motioning the others to remain where they were, and added his light to those already in action.

To the right, as one entered it, the corridor extended almost to the near end of the ship—the bow, as the men thought of it for no good reason. In another direction, it ran about ten yards and opened into a large chamber which, if this craft resembled the *Giansar* as closely within as it did without, was probably the control room. At least, it was just about amidships. Smaller doors opened at intervals along the hallway; some were open, the majority were closed. Nothing moved anywhere.

"Come on," said Grant finally. He walked toward the central room, and paused on the threshold, the others at his heels. The floor they were walking on continued in the form of a catwalk; the chamber they were entering occupied the full interior of the hull at this point. It was brightly lighted, for it was this compartment that possessed the six great view ports, equally spaced around its walls, and the sun shone brightly through these. The men extinguished their own lights. Cray looked about him, and shook his head slowly.

"I still think I must be dreaming, and about to wake up on our own ship," he remarked. "This looks more and more like home, sweet home."

Grant frowned. "Not to me," he replied. "This control layout is the first serious difference I've seen. You wouldn't notice that, of course, spending all your life with the engines. It might be a good idea for you to see if the drive on this ship is enough like ours for you to puzzle out, and whether there's a chance of repairing it. I'll look over this board for signs of a transmitter—after all, the *Mizar* shouldn't be too far away."

"Why shouldn't I be able to understand the drive?" retorted Cray. "It should be like ours, only a little more primitive—depending on how long this boat's been here."

Grant shot him an amazed glance. "Do you still think this is a Terrestrial ship, and has been here only a few decades?" he asked.

"Sure. Any evidence otherwise?"

Grant pointed to the floor beneath their feet. All looked down, and for the first time noticed that they left footprints in a thin, even layer of dust that coated the corridor floor.

"That means that the ship held its air for a longer time than I care to think about—long enough not only to reduce the various organic substances on board to dust, but at random currents to distribute it through the open spaces. Yet when we came the air was almost gone—leaked out through the joints and valves, good as they were, so that there was not enough left to resist us when we pushed a twelve-foot piston against its pressure. Point one."

The finger swung to the control board. "Point two." He said nothing further, but all could see what he meant.

The center of the control room was occupied by a thick-walled hemisphere—a cup, if you like—swung in gimbals which permitted its flat side always to the uppermost with respect to the ship's line of net acceleration. The control board occupied the inner surface and upper edge of this cup, all around the circumference; and in the center of the assembly was the pilot's seat—if it could be called a seat.

It was a dome-shaped structure protruding from the floor about two feet; five broad, deep grooves were spaced equally about its sides, but did not quite reach the top. It looked somewhat like a jelly mold; and the one thing that could be stated definitely about its history was that no human being had ever sat in it. Cray absorbed this evident fact with a gulp, as though he had not chewed it sufficiently.

The rest of the men stared silently at the seat. It was as though the ghost of the long-dead pilot had materialized there and held their frozen attention; overwrought imaginations pictured him, or strove to picture him, as he might have looked. And they also tried to picture what emergency, what unexpected menace, had called upon him to leave the place where he had held sway—to leave it forever. All those men were intelligent and highly trained; but more than one pair of eyes explored the corridor the human invaders had just used, and its mate stretching on from the other side of the control room.

Cray swallowed again, and broke the silence. "I should be able to figure out the engines, anyway," he said, "if they're atomics at all like ours. After all, they have to do the same things our did, and they must have corresponding operations and parts."

"I hope you're right." Grant shrugged invisibly in the bulky suit. "I don't expect to solve that board until you fix something and the pilot lights start signaling—if they have pilot lights. We'd all better get to work. Cray's regular assistants can help him, McEachern had better stay with me and help on the board, and Preble and Stevenson can look over the ship in general. Their fields of specialty won't help much at our jobs. Hop to it." He started across the catwalk toward the control board, with McEachern trailing behind him.

Stevenson and Preble looked at each other. The younger man spoke. "Together, or should we split up?"

"Together," decided the chemist. "That way, one of us will probably see anything the other misses. It won't take much longer; and I doubt that there's much hurry for our job, anyway. We'll follow Cray and company to whichever engine room they go to, and then work from that end to the other. All right?"

Preble nodded, and the two left the control room. The engineers had gone toward the bow—so called because the main entrance port was nearer that end—and the two general explorers followed. The others were not far ahead, and their lights were visible, so the two did not bother to use their own. Stevenson kept one hand on the right-hand wall, and they strode confidently along in the semidarkness.

After a short distance, the chemist's hand encountered the inner door of the air lock by which they had entered. It had been swung by the men all the way back against the wall, leaving both doors open, so that the light was a little better here. In spite of this, he did not see the object on the floor until his foot struck it, sending it sliding along the corridor with a metallic scraping sound that was easily transmitted through the metal of the floor and their suits.

He found it a few feet away, and, near it, two more exactly similar objects. He picked them up, and the two men examined them curiously. They were thick, oval rings, apparently of steel, with an inch or so of steel cable welded to one side of each. The free end of the cable seemed to have been sheared off by some sharp tool. Stevenson and Preble looked at each other, and both directed their lights on the floor about the inner portal of the air lock.

At first, nothing else was noticeable; but after a moment, they saw that the chemist's foot, just before striking the ring, had scraped a groove in a layer of dust much thicker than that over the rest of the floor. It was piled almost to the low sill of the valve, and covered an area two or three feet in radius. Curiously, the men looked at the outer side of the sill, and found a similar flat pile of dust, covering even more of the floor; and near the edges of this layer were five more rings.

These, examined closely, proved larger than the first ones, which had been just a little too small for an average human wrist; but like them, each had a short length of wire cable fused to one side, and cut off a short distance out. There was nothing else solid on the floor of the lock or the corridor, and no mark in the dust except that made by Stevenson's toe. Even the dust and rings were not very noticeable—the seven men had entered the ship through this lock without seeing them. Both men were sure they had some meaning, perhaps held a clue to the nature of the ship's former owners; but neither could decipher it. Preble dropped the rings into a pocket of his spacesuit, and they headed down the corridor again on the track of the engineers.

They caught up with them about a hundred and fifty feet from the control room. The three were standing in front of a heavy-looking, circular door set in a bulkhead which blocked off the passage at this point. It was not featureless, as the air lock doors had been, but had three four-inch disks of darker metal set into it near the top, the bottom, and the left side. Each disk had three holes, half an inch in diameter and of uncertain depth, arranged in the form of an isosceles triangles. The men facing it bore a baffled air, as though they had already tackled the problem of opening it.

"Is this your engine room?" asked Preble, as he and Stevenson stopped beside the others. "It looks more like a pressure lock to me."

"You may be right," returned Cray gloomily. "But there's nowhere else in this end of the ship where an engine room could be, and you remember there were jets at both ends. For some reason they seem to keep the room locked tight—and we don't even know whether the locks are key or combination. If it's combination, we might as well quit now; and if it's key, where is it?"

"They look like the ends of big bolts, to me," suggested Stevenson. "Have you tried unscrewing them?"

Cray nodded. "Royden got that idea, too. Take a closer look at them before you try turning the things, though. If you still feel ambitious, Royden will show you the best way to stick your fingers into the holes."

Preble and the chemist accepted the suggestion, and examined the little disks at close range. Cray's meaning was evident. They were not circular, as they had seemed at first glance; they presented a slightly elliptical cross section, and obviously could never be made to turn in their sockets. The lock theory seemed to remain unchallenged.

That being granted, it behooved them to look for a key. There was no sense toying with the combination idea—there was no hope whatever of solving even a simple combination without specialized knowledge which is seldom acquired legally. They resolutely ignored the probability that the key, if any, was only to be found in the company of the original engineer, and set to work.

Each of them took one of the nearby rooms, and commenced going over it. All the room doors proved to be unlocked, which helped some. Furniture varied but little; each chamber had two seats similar to that in the control room, and two articles which might at one time have been beds; any mattress or other padding they had ever contained was now fine dust, and nothing save metal troughs, large enough to hold a man lying at full length, were left. There was also a desk-like affair, which contained drawers, which opened easily and soundlessly, and was topped by a circular, yard-wide, aluminum-faced mirror. The drawers themselves contained a variety of objects, perhaps toilet articles, of which not one sufficiently resembled anything familiar to provide a clue to its original use.

A dozen rooms were ransacked fruitlessly before the men reassembled in the corridor to exchange reports. One or two of them, hearing of the other's failure returned to the search; Preble, Stevenson, and Sorrell strolled back to the door which was barring their way. They looked at it silently for several moments; then Sorrell began to speak.

"It doesn't make sense," he said slowly. "Why should you lock an engine-room door? If the motors have to be supervised all the time, as ours do, it's a waste of time. If you grant that these creatures had their motors well enough designed to run without more than an occasional inspection, it might be worth while to seal the door against an accidental blowoff; but I still wouldn't lock it. Of course we don't know anything about their ideas of what was common sense.

"But I'd say that that door either isn't fastened at all, and is putting up a bluff like the outer air-lock valve, or else it's really sealed, and would be opened by tools rather than keys. You may think that's quibbling, but it isn't. Keys, you carry around with you, in your pocket or on your belt. Tools have a place where you leave 'em, and are supposed to stay there. Kid, if you were an engineer, in the practice of unsealing this door every few days, perhaps, and needed something like a monkey wrench to do it with, where would you keep the monkey wrench.

Preble ignored the appellation, and thought for a moment. Finally he said, "If I were fastening the door against intentional snooping, I'd keep the tool in my own quarters, locked up. If, as you suggested, it were merely a precaution against accident, I'd have a place for it near the door here. Wouldn't you say so?"

The machinist nodded, and swept his light slowly over the bulkheads around the door. Nothing showed but smooth metal, and he extended the search to the corridor walls for several yards on both sides. The eye found nothing, but Sorrell was not satisfied. He returned to the edge of the door and began feeling over the metal, putting a good deal of pressure behind his hand.

It was a slow process, and took patience. The others watched, holding their lights to illuminate the operation. For several minutes the suit radios were silent, those of the more distant men cut off by the metal walls of the rooms they were searching and the three at the door prosecuting their investigation without speech. Sorrell was looking for a wall cabinet, which did credit to his imagination; such a thing seemed to him the last place to keep tools. He was doing his best to allow for the probably unorthodox ideas of the builders of the ship, reducing the problem as far as he could toward its practical roots, and hoping no physical or psychological traits of the being he never expected to meet would invalidate his answers. As Preble had said, a tool used for only one, specialized purpose logically would be kept near the place in which it was used.

The machinist turned out right, though not exactly as he had expected. He was still running his hands over the wall when Preble remembered a standard type of motor-control switch with which even he was familiar; and, almost without thinking, he reached out, inserted his fingers in the three holes of one of the disks, and pulled outward. A triangular block, indistinguishable in color from the rest of the disk, slid smoothly out into his hand.

The other two lights converged on it, and for a second or two there was silence; then Sorrell chuckled. "You win, Jack," he admitted. "I didn't carry my own reasoning far enough. Go ahead."

Preble examined the block of metal. What had been the inner face was copper-colored, and bore three holes similar to those by which he had extracted it. There was only one other way to fit it into the disk again; he reversed it, with the copper face outward, and felt it slip snugly back into place. Sorrell and Stevenson did the same with the upper and lower disks, which proved to contain similar blocks. Then they stood back, wondering what happened next.

They were still waiting when Cray and Royden rejoined them. The former saw instantly what had been done to the door, and started to speak; then he took a second, and closer look, and, without saying a word, reached up, inserted three fingers in the holes in the coppery triangles of the block face, and began to *unscrew the disk*. It was about five inches thick, and finally came out in his hands. He stared doubtfully at it, and took a huge pair of vernier calipers from the engineer's kit at his side and measured the plug along several diameters. It was perfectly circular, to within the limit of error of his instrument.

He looked at the others at length, and spoke with a note of bewilderment. "I could have sworn this thing was elliptical when we first

examined it. The hole still is, if you'll look." He nodded toward the threaded opening from which the disk had come. "I saw the line where it joined the door seemed a good deal wider at the top and bottom; but I'm sure it fited tightly all around, before."

Sorrell and Royden nodded agreement. Evidently reversing the inset block had, in some fashion, changed the shape of the disk. Cray tried to pull the block out again, but it resisted his efforts, and he finally gave up with a shrug. The men quickly unscrewed the other disks, and Royden leaned against the heavy door. It swung silently inward; and four of the men instantly stepped through, to swing their lights about the new compartment. Cray alone remained at the door, puzzling over the hard-yet-plastic metal object. The simple is not always obvious.

Grant and McEachern, in the control room, were having trouble as well. They had approached the control cup along the catwalk, and the captain had vaulted into its center without difficulty. And he might just as well have remained outside.

The control buttons were obvious enough, though they did not project from the metal in which they were set. They occurred always in pairs —probably an "on" and "off" for each operation; and beside each pair were two little transparent disks that might have been monitor lights. All were dark. Sometimes the pairs of buttons were alone; sometimes they were in groups of any number up to eighteen or twenty. Each group was isolated from its neighbors; and they extended completely around the foot-wide rim of the cup, so that it was not possible to see them all at once.

But the thing that bothered Grant the most was the fact that not a single button, light, or group was accompanied by a written label of any sort. He would not have expected to be able to read any such writing; but there had been the vague hope that control labels might have been matched with similar labels on the machines or charts—if the other men found any of either. It was peculiar, for there were in all several hundred buttons; and many of the groups could easily have been mistaken for each other. He put this thought into words, and McEachern frowned behind his helmet mask before replying.

"According to Cray's logic, why should they be labeled?" he remarked finally. "Do we allow anyone to pilot a ship if he doesn't know the board blindfolded? We do label ours, of course, on the theory that an inexperienced man might have to handle them in an emergency; but that's self-deception. I've never heard of any but a first-rank pilot bringing a ship through an emergency. Labeling controls is a carry-over from the family auto and airplane."

"There's something in that," admitted the captain. "There's also the possibility that this board is labeled, in a fashion we can't make out. Suppose the letters or characters were etched very faintly into that metal, which isn't polished, you'll notice, and were meant to be read by, say, a delicate sense of touch. I don't believe that myself, but it's a possibility—one we can't check, since we can't remove our suits to feel. The fact that there are no obvious lights for this board lends it some support; they couldn't have depended on sunlight *all* the time."

"In either case, fooling around here at this stage may do more harm than good," pointed out McEachern. "We'll have to wait until someone gets a machine identified, and see if tampering with it produces any results here."

Grant's helmet nodded agreement. "I never had much hope of actually starting the ship," he said, "since it seems unlikely that anything but mechanical damage of a serious nature could have stranded it here; but I did have some hopes from the communicators. There must be some."

"Maybe they didn't talk," remarked the navigator.

"If that's your idea of humor, maybe you'd better not, yourself," growled Grant. He vaulted back to the catwalk, and morosely led the way forward, to see if the engineers or free-lance investigators had had any luck. McEachern followed, regretting the remark, which must have jarred the commander's optimism at an unfortunate time. He tried to think of something helpful to say, but couldn't; so he wisely kept quiet.

Halfway to the bow, they met Preble and Stevenson, who had satisfied themselves that the others could do better in the engine room and were continuing their own general examination of the ship. They gave the officers a brief report on events forward, showed them the metal rings found by the air lock, and went on aft to find some means of visiting the corridors which presumably existed above and below the main one. The control room seemed the logical place to look first, though neither had noticed any other openings from it when they were there the first time. Perhaps the doors were closed, and less obvious.

But there were no other doors, apparently. Only two means of access and egress to and from the control room appeared to exist, and these were the points where the main corridor entered it.

"There's a lot of room unaccounted for, just the same," remarked Stevenson after the search, "and there must be some way into it. None of the rooms we investigated looking for that 'key' had any sign of a ramp or stairway or trapdoor; but we didn't cover them all. I suggest we each take one side of the bow corridor, and look behind every door we can open. None of the others was locked, so there shouldn't be much trouble."

Preble agreed, and started along the left-hand wall of the passage, sweeping it with his light as he went. The chemist took the right side and did likewise. Each reached a door simultaneously, and pushed it open; and a simultaneous "Here it is" crackled from the suit radios. A spiral ramp, leading both up and down, was revealed on either side of the ship, behind the two doors.

"That's more luck than we have a right to expect," laughed Stevenson. "You take your side, I'll take mine, and we'll meet up above."

Preble again agreed silently, and started up the ramp. It was not strictly accurate to call it a spiral; it was a curve evidently designed as a compromise to give some traction whether the ship were resting on its belly on a high-gravity planet, or accelerating on its longitudinal axis, and it did not make quite a complete turn in arriving at the next level above. Preble stepped on to it facing the port side, and stepped off facing sternward, with a door at his left side. This he confidently tried to push open, since like the others it lacked knob or handle; but unlike them, it refused to budge.

There was no mystery here. The most cursory of examination disclosed the fact that the door had been welded to its frame all around—raggedly and crudely, as though the work had been done in frantic haste, but very effectively. Nothing short of a high explosive or a heavy-duty cutting arc could have opened that portal. Preble didn't even try. He returned to the main level, meeting Stevenson at the foot of the ramp. One look at his face was enough for the chemist.

"Here, too?" he asked. "The door on my side will never open while this ship is whole. Someone wanted to keep something either outside or inside that section."

"Probably in, since the welding was done from outside," replied Preble. "I'd like to know what it was. It would probably give us an idea of the reason for the desertion of this ship. Did you go down to the lower level?"

"Not yet. We might as well go together—if one side is sealed, the other probably will be, too. Come on."

They were still on the left-hand ramp, so it was on this side that they descended. A glance at the door here showed that, at least, it was not welded; the pressure of a hand showed it to be unlocked. The two men found themselves at the end of a corridor similar in all respects to the one above, except that it came to a dead end to the right of the door instead of continuing on into the central chamber. It was pitch-dark, except for the reflections of the hand lights on the polished metal walls and along either side were doors, perhaps a trifle larger than most of the others on the ship. Many of these were ajar, others closed tightly; and by common consent the men stepped to the nearest of the former.

The room behind it proved similar in size to those above, but it lacked the articles which the men had come to look upon as the furniture of the long-dead crew. It was simply a bare, empty cubicle.

The other chambers, quickly examined, showed no striking difference from the first. Several contained great stacks of metal ingots, whose inertia and color suggested platinum or iridium; all were thickly coated with dust, as was the floor of the corridor. Here, too, there must have been organic materials, whether crew or cargo none could tell, which had slowly rotted away while the amazingly tight hull held stubbornly to its air. The makers of the ship had certainly been superb machinists—no vessel made by man would have held atmosphere more than a few months, without constant renewal.

"Have you noticed that there is nothing suggestive of a lock on any of these doors?" asked Preble, as they reached the blank wall which shut them off from the engine room in front.

"That's right," agreed Stevenson. "The engine-room port was the only one which had any obvious means of fastening. You'd think there would be need to hold them against changes in acceleration, if nothing else."

He went over to the nearest of the doors and with some care examined its edge, which would be hidden when it was closed; then he beckoned to Preble. Set in the edge, almost invisible, was a half-inch circle of metal slightly different in color from the rest of the door. It seemed perfectly flush with the metal around it. Just above the circle was a little dot of copper.

Both objects were matched in the jamb of the door—the copper spot by another precisely similar, the circle by a shallow, bowl-shaped indentation of equal size and perhaps a millimeter deep. No means of activating the lock, if it were one, were visible. Stevenson stared at the system for several minutes, Preble trying to see around the curve of his helmet.

"It's crazy," the chemist said at last. "If that circle marks a bolt, why isn't it shaped to fit the hollow on the jamb? It couldn't be moved forward a micron, the way it is. And the thing can't be a magnetic lock—the hollow proves that, too. You'd want the poles to fit as snugly as possible, not to have the field weakened by an air gap. What is it?"

Preble blinked, and almost bared his head in reverence, but was stopped by his helmet. "You have it, friend," he said gently. "It *is* a magnetic lock. I'd bet"—he glanced at the lung dial on his wrist —"my chance of living another hundred hours that's the story. But it's not based on magnetic attraction—it's magnetostriction. A magnetic field will change the shape of a piece of metal—somewhat as a strong electric field does to a crystal. They must have developed alloys in which the effect is extreme. When the curernt is on, that 'bolt' of yours fits into the hollow in the jamb, without any complicated lever system to move it. This, apparently, is a cargo hold, and all the doors are probably locked by one master switch—perhaps on the control board, but more probably down here somewhere. So long as a current is flowing, the doors are locked. The current in any possible storage device must have been exhausted ages ago, even if these were left locked."

"But what about the engine-room door?" asked Stevenson. "Could that have been of this type? It was locked, remember." Preble thought for a moment.

"Could be. The removable block might have been a permanent magnet that opposed another when it was in one way, and reinforced it when it was reversed. Of course, it would be difficult to separate them once they were placed in the latter position; maybe the ship's current was used to make that possible. Now that the current is off, it may be that there will be some difficulty in returning that block to its original position. Let's go and see." He led the way back along the corridor to the ramp.

Cray received the theory with mingled satisfaction and annoyance; he should, he felt, have seen it himself. He had already discovered that the triangular blocks had developed an attachment for their new positions, and had even considered magnetism in that connection; but the full story had escaped him. He had had other things to worry about, anyway.

The free-lance seekers had met the engineer at the entrance to the engine room. Now the three moved inside, stepping out onto a catwalk similar to that in the control room. This chamber, however, was illuminated only by the hand torches of the men; and it was amazing to see how well they lit up the whole place, reflecting again and again from polished metal surfaces.

When one had seen the tube arrangement from outside the ship, it was not difficult to identify most of the clustered machines. The tube breeches, with their heavy injectors and disintegrators, projected in a continuous ring around the walls and in a solid group from the forward bulkhead. Heavily insulated leads ran from the tubes to the supplementary cathode ejectors. It seemed evident that the ship had been driven and steered by reaction jets of heavy-metal ions, as were the vessels of human make. All the machines were incased in heavy shields, which suggested that their makers were not immune to nuclear radiation.

"Not a bad layout," remarked Preble. "Found out whether they'll run?"

Cray glared. "No!" he answered almost viciously. "Would you mind taking a look at their innards for us?"

Preble raised his eyebrows, and stepped across the twenty-foot space between the catwalk and the nearest tube breech. It was fully six feet across, though the bore was probably not more than thirty inches—the walls had to contain the windings for the field which kept the ion stream from actual contact with the metal. The rig which was presumably the injector-disintegrator unit was a three-foot bulge in the center, and the insulated feed tube led from it to a nearby fuel container. The fuel was probably either mercury or some other easily vaporized heavy metal, such as lead. All this seemed obvious and simple enough, and was similar in basic design to engines with which even Preble was familiar; but there was a slight departure from convention in that the entire assembly, from fuel line to the inner hull, appeared to be one seamless surface of metal. Preble examined it closely all over, and found no trace of a joint.

"I see what you mean," he said at last, looking up. "Are they all the same?" Cray nodded.

"They seem to be. We haven't been able to get into any one of them—even the tanks are tight. They *look* like decent, honest atomics, but we'll never prove it by looking at the outside."

"But how did they service them?" asked Stevenson. "Surely they didn't weld the cases on and hope their machines were good enough to run without attention. That's asking too much, even from a race that built a hull that could hold air as long as this must have."

"How could I possibly know?" growled Cray. "Maybe they went outside and crawled in through the jets to service 'em—only I imagine it's some trick seal like the door of this room. After all, *that* was common sense, if you look at it right. The fewer moving parts, the less wear. Can anyone think of a way in which this breech mechanism could be fastened on, with an invisible joint, working from the same sort of common sense?"

Why no one got the answer then will always remain a mystery; but the engineer was answered by nothing but half a dozen thought expressions more or less hidden in space helmets. He looked around hopefully for a moment, then shrugged his shoulders. "Looks like we'll just have to puzzle around and hope for the best," he concluded. "Jack and Don might as well go back to their own snooping—and for Heaven's sake, if you get any more ideas, come a-runnin'."

After glancing at Grant for confirmation of the suggestion, Preble and Stevenson left the engine room to continue their interrupted tour.

"I wonder if the upper section behind the control room is sealed," remarked the chemist as they entered the darkness of the corridor. "I think we've covered the bow fairly well." Preble nodded; and without further speech they passed through the control chamber, glancing at the board which had given Grant and McEachern such trouble, and found, as they expected, ramps leading up and down opening from the rear corridor just as one entered.

They stayed together this time, and climbed the starboard spiral. The door at the top opened easily, which was some relief; but the hallway beyond was a disappointment. It might have been any of the others already visited; and a glance into each of the rooms revealed nothing but bare metal gleaming in the flashlight beams, and dust-covered floors. The keel corridor was also open; but here was an indication that one, at least, of the rooms had been used for occupancy rather than cargo.

Stevenson looked into it first, since it was on the side of the corridor he had taken. He instantly called his companion, and Preble came to look at the object standing in the beam of the chemist's light.

It was a seat, identical to the one in the control chamber—a mound of metal, with five deep grooves equally spaced around it. The tiny reflected images of the flashlights stared up from its convex surfaces like luminous eyes. None of the other furniture that had characterized the room in the central bow corridor was present; but the floor was not quite bare.

Opposite each of the five grooves in the seat, perhaps a foot out from it, a yard-long metal cable was neatly welded to the floor. A little farther out, and also equally spaced about the seat, were three more almost twice as long. The free end of each of the eight cables was cut off cleanly, as though by some extremely efficient instrument; the flat cut surfaces were almost mirror-smooth. Stevenson and Preble examined them carefully, and then looked at each other with thoughtful expressions. Both were beginning to get ideas. Neither was willing to divulge them.

There remained to explore only the stern engine room and the passage leading to it, together with the rooms along the latter. They had no tools with which to remove a specimen of one of the cables, so they carefully noted the door behind which the seat and its surroundings had been found, and climbed once more to the central deck. Before making their last find, they had begun to be bored with the rather monotonous search, particularly since they had no clear idea of what they were searching for; without it, they might have been tempted to ignore the rooms along the corridor and go straight to the engine room. Now, however, they investigated every chamber carefully; and their failure to find anything of interest was proportionally more disappointing.

And then they reached the engine-room door.

Flashlights swept once over the metal surface, picking out three disks with their inset triangular blocks, as the men had expected, but the coppery reflection from two of the blocks startled them into an instant motionlessness. Of the three seals, they realized, only one —the uppermost—was locked. It was as though whoever had last been in the room had left hastily—or was not a regular occupant of the ship.

Preble quickly reversed the remaining block, and unscrewed the three disks; then the two men leaned against the door and watched it swing slowly open. Both were unjustifiably excited; the state of the door had stimulated their imaginations, already working overtime on the material previously provided. For once, they were not disappointed.

The light revealed, besides the tanks, converters, and tube breeches which had been so obvious in the forward engine room, several open cabinets which had been mere bulges on the walls up forward. Tools and other bits of apparatus filled these and lay about on the floor. Light frameworks of metal, rather like small building scaffolds, inclosed two of the axial tube breeches; and more tools lay on these. It was the first scene they had encountered on the ship that suggested action and life rather than desertion and stagnation. Even the dust, present here as everywhere, could not eradicate the impression that the workers had dropped their tools for a brief rest, and would return shortly.

Preble went at once to the tubes upon which work had apparently been in progress. He was wondering, as he had been since first examining one, how they were opened for servicing. He had never taken seriously Cray's remark that it might have been done from outside.

His eye caught the thing at once. The dome of metal that presumably contained the disintegrator and ionizing units had been disconnected from the fuel tank, as he had seen from across the room; but a closer look showed that it had been removed from the tube, as well, and replaced somewhat carelessly. It did not match the edges of its seat all around, now; it was displaced a little to one side, exposing a narrow crescent of flat metal on each of the two faces normally in complete contact. An idea of the position can be obtained by placing two pennies one on the other, and giving the upper one a slight sideward displacement.

The line of juncture of the two pieces was, therefore, visible all around. Unfortunately, the clamping device Preble expected to find was not visible anywhere. He got a grip—a very poor one, with his gloved hand—on the slightly projecting edge of the hemisphere, and tried to pull it free, without success; and it was that failure which gave him the right answer—the only possible way in which an air-tight and pressure-tight seal could be fastened solidly, even with the parts out of alignment, with nonmagnetic alloys. It was a method that had been used on Earth, though not on this scale; and he was disgusted at his earlier failure to see it.

Magnetism, of course, could not be used so near the ion projectors, since it would interfere with the controlling fields; but there was another force, ever present and available—molecular attraction. The adjoining faces of the seal were *plane,* not merely flat. To speak of their accuracy in terms of the wave length of sodium light would be useless; a tenth-wave surface, representing hours of skilled human hand labor, would be jagged in comparison. Yet the relatively large area of these seals and the frequency with which the method appeared to have been used argued mass production, not painstaking polishing by hand.

But if the seal were actually wrung tight, another problem presented itself. How could the surfaces be separated, against a force sufficient to confine and direct the blast of the ion rockets? No marks on the breech suggested the application of prying tools—and what blade could be inserted into such a seal?

Stevenson came over to see what was keeping Preble so quiet, and listened while the latter explained his discovery and problems.

"We can have a look through these cabinets," the chemist remarked finally. "This seems to fit Sorrell's idea of a tool-requiring job. Just keep your eyes and mind open."

The open mind seemed particularly indicated. The many articles lying in and about the cabinets were undoubtedly tools, but their uses were far from obvious. They differed from man-made tools in at least one vital aspect. Many of our tools are devices for *forcing:* hammers, wrenches, clamps, pliers, and the like. *A really good machine job would need no such devices.* The parts would fit, with just enough clearance to eliminate undesired friction—and no more.

That the builders of the ship were superb designers and machinists was already evident. What sort of tools they would need was not so obvious. Shaping devices, of course; there were planers, cutters, and grinders among the littered articles. All were portable, but solidly built, and were easily recognized even by Preble and Stevenson. But what were the pairs of slender rods which clung together, obviously magnetized? What were the small, sealed-glass tubes; the long, grooved strips of metal and plastic; the featureless steel-blue spheres; the iridescent, oddly shaped plates of paper-thin metal? The amateur investigators could not even guess, and sent for professional help.

Cray and his assistants almost crooned with pleasure as they saw the untidy floor and cabinets; but an hour of careful examination and theorizing left them in a less pleasant mood. Cray conceded that the molecular attraction theory was most probably correct, but made no headway at all on the problem of breaking the seal. Nothing in the room seemed capable of insertion in the air-tight joint.

"Why not try sliding them apart?" asked Stevenson. "If they're as smooth as all that, there should be no difficulty."

Cray picked up a piece of metal. "Why don't you imagine a plane through this bar, and slide it apart along that?" he asked. "The crystals of the metal are practically as close together, and grip each other almost as tightly, in the other case. You'll have to get something between them."

The chemist, who should have known more physics, nodded. "But it's more than the lubricant that keeps the parts of an engine apart," he said.

"No, the parts of one of our machines are relatively far apart, so that molecular attraction is negligible," answered the machinist. "But —I believe you have something there. A lubricant might do it; molecules might conceivably work their way between those surfaces. Has anybody noticed anything in this mess that might fill the bill?"

"Yes," answered Preble promptly, "these glass tubes. They contain liquid, and have been fused shut— which is about the only way you could seal in a substance such as you would need."

He stepped to a cabinet and picked up one of the three-inch long, transparent cylinders. A short nozzle, its end melted shut, projected from one end, and a small bubble was visible in the liquid within. The bubble moved sluggishly when the tube was inverted, and broke up into many small ones when it was shaken. These recombined instantly when the liquid came to rest, which was encouraging. Evidently the stuff possessed a very low viscosity and surface tension.

Cray took the tube over to the breech which had been partly opened and carelessly closed so long ago, held the nozzle against the edge of the seal, and, after a moment's hesitation, snapped off the tip with his gloved fingers. He expected the liquid to ooze out in the asteroid's feeble gravity, but its vapor pressure must have been high, for it sprayed out in a heavy stream. Droplets rebounded from the metal

and evaporated almost instantly; with equal speed the liquid which spread over the surface vanished. Only a tiny fraction of a percent, if that, could have found its way between the surfaces.

Cray stared tensely at the dome of metal as the tube emptied itself. After a moment, he dropped the empty cylinder and applied a sideways pressure.

A crescent, of shifting rainbow colors, appeared at the edge of the seal; and the dome slowly slid off to one side. The crescent did not widen, for the lubricant evaporated the instant it was exposed. Preble and Stevenson caught the heavy dome and eased its mass to the central catwalk.

The last of the rainbow film of lubricant evaporated from the metal, and the engineers crowded around the open breech. There was no mass of machinery inside; the disintegrators would, of course, be within the dome which had been removed. The coils which generated the fields designed to keep the stream of ionized vapor from contact with the tube walls were also invisible, being sealed into the tube lining. Neither of these facts bothered the men, for their own engines had been similarly designed. Cray wormed his way down the full length of the tube to make sure it was not field failure which had caused it to be opened in the first place; then the three specialists turned to the breech which had been removed.

The only visible feature of its flat side was the central port through which the metallic vapor of the exhaust had entered the tube; but application of another of the cylinders of lubricant, combined with the asteroid's gravity, caused most of the plate to fall away and reveal the disintegrator mechanism within. Preble, Stevenson, Grant, and McEachern watched for a while as piece of the disintegrator began to cover the floor of the room; but they finally realized that they were only getting in the way of men who seemed to know what they were doing, so a gradual retreat to the main corridor took place.

"Do you suppose they can find out what was wrong with it?" queried Stevenson.

"We should." It was Cray's voice on the radio. "The principle of this gadget is exactly like our own. The only trouble is that they've used that blasted molecular-attraction fastening method everywhere. It's taking quite a while to get it apart."

"It's odd that the technology of these beings should have been so similar to ours in principle, and yet so different in detail," remarked Grant. "I've been thinking it over, and can't come to any conclusion as to what the reason could be. I thought perhaps their sense organs were different from ours, but I have no idea how that could produce such results—not surprising, since I can't imagine what sort of senses could exist to replace or supplement ours."

"Unless there are bodies in the sealed-off corridor and rooms, I doubt if you'll ever find the answer to that one," answered Preble. "I'll be greatly surprised if anyone ever proves that this ship was made in this solar system."

"I'll be surprised enough if anyone proves anything at all constructive about it," returned Grant.

Cray's voice interrupted again.

"There's something funny about part of this," he said. "I think it's a relay, working from your main controls, but that's only a guess. It's not only connected to the electric part of the business, but practically built around the fuel inlet as well. By itself it's all right; solienoid and moving core type. We've had it apart, too."

"What do you plan to do?" asked Grant. "Have you found anything wrong with the unit as a whole?"

"No, we haven't. It has occurred to me that the breech was unsealed for some purpose other than repair. It would make a handy emergency exit—and that might account for the careless way it was resealed. We were thinking of putting it back together, arranging the relay so that we can control it from here and test the whole tube. Is that all right with you?"

"If you think you can do it, go ahead," replied Grant. "We haven't got much to lose, I should say. Could you fix up the whole thing to drive by local control?"

"Possibly. Wait till we see what happens to this one." Cray moved out of the line of sight in the engine-room doorway, and his radio waves were cut off.

Stevenson moved to the doorway to watch the process of reassembly; the other three went up to the control room. The eeriness of the place had worn off—there was no longer the suggestion of the presence of the unknowable creature who had once controlled the ship. Preble was slightly surprised, since it was now night on this part of the asteroid; any ghostly suggestions should have been enhanced rather than lessened. Familiarity must have bred contempt.

No indicator lights graced the control panel. Grant had half hoped that the work in the engine room might have been recorded here; but he was not particularly surprised. He had given up any hopes of controlling the vessel from this board, as his remark to Cray had indicated.

"I hope Cray can get those tubes going," he said after a lengthy silence. "It would be enough if we could push this ship even in the general direction of Earth. Luckily the orbit of this body is already pretty eccentric. About all we would have to do is correct the plane of motion."

"Even if we can't start enough tubes to control a flight, we could use one as a signal flare," remarked Preble. "Remember, the *Mizar* is in this sector; you once had hopes of contacting her with the signal equipment of this ship, if you could find any. The blast from one of these tubes, striking a rock surface, would make as much light as you could want."

"That's a thought," mused Grant. "As usual, too simple for me to think of. As a matter of fact, it probably represents our best chance. We'll go down now and tell Cray simply to leave the tube going, if he can get it started."

The four men glided back down the corridor to the engine room. The reassembly of the breech mechanism was far from completed, and Grant did not like to interrupt. He was, of course, reasonably familiar with such motors, and knew that their assembly was a delicate task even for an expert.

Cray's makeshift magnetic device for controlling the relay when the breech was sealed was a comment on the man's ingenuity. It was not his fault that none of the men noticed that the core of the relay was made of the same alloy as the great screw cocks which held the engine-room doors shut, and the small bolts on the doors in the cargo hold. It was, in fact, a delicate governor, controlling the relation between fuel flow and the breech field strength—a very necessary control, since the field had to be strong enough to keep the hot vapor from actual contact with the breech, but not strong enough to overcome the effect of the fields protecting the throat of the tube, which were at right angles to it. There was, of course, a similar governor in man-made motors, but it was normally located in the throat of the tube and was controlled by the magnetic effect of the ion stream. The device was not obvious, and of course was not of a nature which a human engineer would anticipate. It might have gone on operating normally for an indefinite period, if Cray had used any means whatever, except magnetic manipulation, to open and close the relay.

The engineers finally straightened and stood back from their work. The breech was once more in place, this time without the error in alignment which had caused the discovery of the seal. Clamped to the center of the dome, just where the fuel feed tube merged with its surface, was the control which had been pieced together from articles found in the tool cabinets. It was little more than a coil whose field was supposed to be strong enough to replace that of the interior solienoid through the metal of the breech.

Preble had gone outside, and now returned to report that the slight downward tilt of the end of the ship in which they were working would cause the blast from this particular tube to strike the ground fifty or sixty yards to the rear. This was far enough for safety from splash, and probably close enough so that the intensity of the blast would not be greatly diminished.

Cray reported that the assembly, as nearly as he could tell, should work.

"Then I suggest that you and anyone you need to help you remain here and start it in a few moments, while the rest of us go outside to observe results. We'll keep well clear of the stern, so don't worry about us," said Grant. "We're on the night side of the asteroid now, and, as I remember, the *Mizar* was outward and counterclockwise of this asteroid's position twenty-four hours ago—by heaven, I've just realized that all this has occurred in less than twenty hours. She should be able to sight the flare at twenty million miles, if this tube carries half the pep that one of ours would."

Cray nodded. "I can start it alone," he said. "The rest of you go on out. I'll give you a couple of minutes, then turn it on for just a moment. I'll give you time to send someone in if anything is wrong."

Grant nodded approval, and led the other five men along the main corridor and out the air lock. They leaped to a position perhaps a hundred and fifty yards to one side of the ship, and waited.

The tube in question was one of the lowest in the bank of those parallel to the ship's longitudinal axis. For several moments after the men had reached their position it remained lifeless; then a silent, barely visible ghost of flame jetted from its lip. This changed to a track of dazling incandescence at the point where it first contacted the rock of the asteroid; and the watchers automatically snapped the glare shields into place on their helmets. These were all in place before anyone realized that the tube was still firing, cutting a glowing canyon into the granite and hurling a cloud of boiling silica into space. Grant stared for a moment, leaped for the air lock, and disappeared inside. As he entered the control room from the front, Cray burst in from the opposite end, making fully as good time as the captain. He didn't even pause, but called out as he came:

"She wouldn't cut off, and the fuel flow is increasing. I can't stop it. Get out before the breech gives— I didn't take time to close the engine-room door!"

Grant was in midair when the engineer spoke, but he grasped a stanchion that supported the catwalk, swung around it like a comet, and reversed his direction of flight before the other man caught up to him. They burst out of the air lock at practically the same instant.

By the time they reached the others, the tube fields had gone far out of balance. The lips of the jet tube were glowing blue-white and vanishing as the stream caught them; and the process accelerated as the men watched. The bank of stern tubes glowed brightly, began to drip, and boiled rapidly away; the walls of the engine room radiated a bright red, then yellow, and suddenly slumped inward. That was the last straw for the tortured disintegrator; its own supremely resistant substance yielded to the lack of external cooling, and the device ceased to exist. The wreckage of the alien ship, glowing red now for nearly its entire length, gradually cooled as the source of energy ceased generating; but it would have taken supernatural intervention to reconstruct anything useful from the rubbish which had been its intricate mechanism. The men, who had seen the same thing happen to their own ship not twenty hours before, did not even try to do so.

The abruptness with which the accident had occurred left the men stunned. Not a word was spoken, while the incandescence faded slowly from the hull. There was nothing to say. They were two hundred million miles from Earth, the asteroid would be eighteen months in reaching its nearest point to the orbit of Mars—and Mars would not be there at the time. A search party might eventually find them, since the asteroid was charted and would be known to have been in their neighborhood at the time of their disappearance. That would do them little good.

Rocket jets of the ion type are not easily visible unless matter is in the way—matter either gaseous or solid. Since the planetoid was airless and the *Mizar* did not actually land, not even the usually alert Preble saw her approach. The first inkling of her presence was the voice of her commander, echoing through the earphones of the seven castaways.

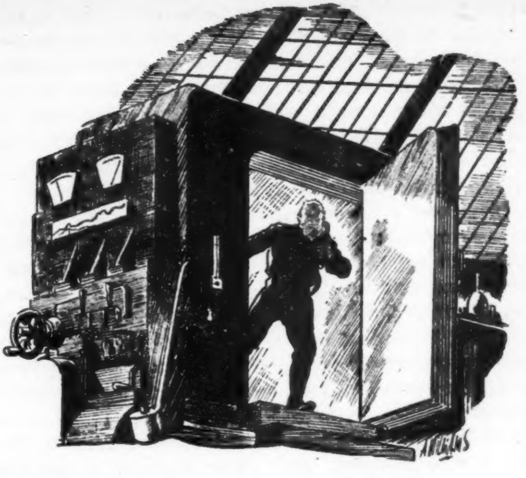
"Hello, down there. What's been going on? We saw a flare about twenty hours ago on this body that looked as though an atomic had misbehaved, and headed this way. We circled the asteroid for an hour or so, and finally did sight your ship—just as she did go up. Will you please tell us what the other flare could have been? Or didn't you see it?"

It was the last question that proved too much for the men. They were still laughing hysterically when the *Mizar* settled beside the wreck and took them aboard. Cray alone was silent and bitter.

"In less than a day," he said to his colleague on the rescue ship, "I wrecked two ships—and I haven't the faintest idea how I wrecked either one of them. As a technician, I'd be a better groundcar mechanic. That second ship was just lying there waiting to teach me more about shop technique than I'd have learned in the rest of my life; and some little technical slip ruined it all."

But whose was the error in technique?

THE END.



As Never Was

by P. Schuyler Miller

***That** bit of marvelous metal upset the whole world of science—science tried to find where it had come from. But they never would, never could—*

Illustrated by Williams

HAVE you ever dreamed of murder?

Have you ever set your elbows on the desk and let your head slump down on your hands, and closed your eyes, and dreamed of how it would feel to drive a knife up to the hilt in a scrawny, wrinkled throat, and twist it until the thin old blood begins to slime your fingers and drip from your wrist—until the piercing old eyes roll back and close, and the skinny old legs crumple and sag? Have you felt the blood pounding in your own temples, and savage satisfaction swarming up in you as you stare down on the hideous, sprawling thing you have destroyed?

And then have you opened your eyes and looked down at the mass of scribbled papers, and the meticulously drawn sectional charts, and the trait tables and correlation diagrams and all the other dead, dry details that make up your life's work? And picked up your pen and started making more scribbles on the papers and more checks on the charts and more little colored dots on the scattergrams, just as you've been doing three days out of every five since you were old enough to start the career for which you'd been tested and picked and trained?

Maybe I should go to a clinic and let the psychotherapists feed vitamins to my personality. Maybe I should go to a religious center and let the licensed clergy try to put this fear of Humanity into my reputed soul. Maybe I should go to a pleasure palace and let them mix me up an emotional hooker to jar the megrims out of my disposition, or go down and apply for a permit to wed and set about begetting another generation of archeologists who will grow up to be just as tired and bored and murderous as their illustrious father.

Night after night and day after day I dream of what might have happened that day in the laboratory if I had picked up the knife and slit the gullet of the man who had just injected the time-steam concept into the quietly maturing science of human archeology. If I could have seen ahead— If I could have guessed what would happen to all the romantic visions he had worked so hard to inspire in me—

Why should I dream? I was a child then; I had no way of looking ahead; the knife was just another knife. And I think if *he* had known—if he had been able to see ahead and watch the science to which he had devoted his every waking moment for a long lifetime degenerate into a variety of three-dimensional bookkeeping—he'd have cut his own heart out and offered it to me in apology.

He was a great old man. He was my grandfather.

You've seen the knife. Everyone has, I guess. I was the first, after him, ever to see it, and I was about ten years old. I was sitting in a chair in his laboratory, waiting for him to come back. It was a wooden chair, something his grandfather had used, and maybe other people before that. The laboratory was just a big room at the back of the house, with a concrete floor and plenty of light from a row of windows over the worktable. There were hundreds of potsherds strewn over the table where he'd been classifying and matching them for restoration. There were trays of stone implements, and cheap wooden boxes full of uncatalogued stuff with the dirt still on it. There was a row of battered-looking notebooks, bound in imitation leather, fraying at the corners and stained with ink and dirt. There was a pot that had been half restored, the sherds joined so neatly that you could barely see where they fitted together, and a little ivory goddess whose cracks and chips were being replaced with a plastic filler until you'd never have known she was five thousand years old.

That was what an archeologist's laboratory was like in those days. Of course, we've outgrown all that. His experiment, and the knife he brought back and tossed down on the table for me to look at, have ended all that. Archeology has found its place among the major sciences. It's no longer a kind of bastard stepchild of art and anthropology. We got money for the best equipment, the newest gadgets. We have laboratories designed by the best architects to fit the work we do in them. We can call on the technicians of a score of other sciences to do our dirty work, or can train ourselves to know as much as they do if we're reactionaries like me. We have our own specialists, just as learned and as limited as any hairsplitter in biochemistry or galactic physics. We have prestige—recognition—everything he never had in his day, when he was the acknowledged master in his field, and we have him to thank for it all. But Walter Toynbee, if he were living now, would dry up and die in the kind of laboratory his grandson has. He'd push his charts and his correlations back and drop his head in his hands and dream. He'd plan out his own murder.

I'd been sitting there for nearly six hours. I'd been over the worktable from one end to the other, three times. I'd picked up every potsherd—turned them over—studied them with all the solemn intentness of ten years old—put them back exactly where I'd found them, as he had taught me. I'd found four sherds that would fit onto the pot he was restoring, and two that made an ear for a little clay figurine shaped like a fat, happy puppy. I'd taken down his books, one by one, and looked at the plates and figures as I had done many times before. I had even taken down one of his notebooks and slowly leafed through it, trying to spell out the straggling handwriting and make sense of the precise sketches, until a loose slip of paper fell out from among the pages and I slipped it hurriedly back and put the book away.

All one corner of the laboratory was taken up by the time shuttle. It had cost more than all the air surveys, all the expeditions, all the books and photographs and restorations of his whole career. The copper bus bars that came in through the wall behind it were like columns in some Mayan colonnade. The instrument panel was like something you'd imagine on—well, on a time machine. The machine itself was a block of dull gray lead with a massive steel door in one side of it, the time cell floating in a magnetic bearing between the pole pieces which set up the field.

Ours are neater now, but inside they're about the same. Old Walter Toynbee was an artist to the core, and Balmer, who built the machine for him from Malecewicz's notes, had a flair for functional design. It was the first shuttle big enough and powerful enough to push a man and his baggage more than twenty years into the future—or the past, for that matter. Malecewicz had gone back fifteen years. He never returned. His equations showed why that was, and the archeological world, which had been rubbing its hands in anticipation of striking up a speaking acquaintance with Hatshepsut and Queen Shub-Ad, went back to its trowels and whiskbrooms with sighs of resignation. All but my grandfather. All but Walter Toynbee.

Malecewicz had never taken time to really work out his theory of the time function and lapsed interval, or he might be alive now. Laymen will still ask you why we archeologists don't simply climb into a shuttle with a solido camera and slip back to Greece or Elam or maybe Atlantis, and film what went on instead of tediously slicing the dust of millennia over the graveyards of past civilizations. It can be done, but the man who does it must be utterly self-centered, wrapped up in knowledge for its own sake, utterly unconcerned with his duties to his fellow men. As any schoolchild learns, the time shuttler who goes into the past introduces an alien variable into the spacio-temporal matrix at the instant when he emerges. The time stream forks, an alternative universe is born in which his visit is given its proper place, and when he returns it will be to a future level in the new world which he has created. His own universe is forever barred to him.

The future is by nature different. All that we are now and all that we have been or become from moment to moment is integral in the structure and flow of our particular thread of time. The man who visits the future is not changing it: his visit is a foredestined part of that future. As the ancients might have said: "It is written." Though I should imagine that the writing is in the matrix of spacetime and not in the record book of God.

Walter Toynbee was a brilliant man who might have made a success of many sciences. He had money to guarantee him such comfort as he might want, and he chose the science which most attracted him—archeology. He was the last of the great amateurs. He had known Malecewicz well—financed some of his experimental work—and when the physicist failed to return he wheedled the trustees of the university into turning the man's notes over to him. He showed them almost at once where Malecewicz had gone and why he would never return, and he saw immediately that there was no such barrier between Man and his tomorrows. Inside of a week he and Balmer were moving cases of artifacts out of the back room to make room for the shuttle. Night after night they sat up into the wee hours, arguing over fantastic-looking diagrams. In two months the power lines were coming in across the fields, straight from the generators at Sheldon Forks, and Balmer's men were pouring the colossal concrete base on which the machine would sit.

It was past dinner time. I had been sitting there alone since a little after one o'clock, when he had stepped into the shuttle and asked me to wait until he returned. There it sat, just as it had sat for the last six hours, shimmering a little as though the air around it were hot and humming like a swarm of bees deep in an old beech. I got down a big book of plates of early Sumerian cylinder seals and began to turn the pages slowly. The sameness of them had grown boring when I realized that the humming had stopped.

I looked up at the lead cube. It was no longer shimmering. I closed the book and put it carefully back on the shelf, just as the great steel door of the shuttle swung silently open, and my grandfather stepped down out of the time cell.

He had been digging. His breeches and heavy jacket were covered with whitish dust. Dirt made grimy gutters under his eyes and filled in the creases and wrinkles of his face and neck. He had a stubble of dirty gray beard on his chin, which hadn't been there six hours before, and his shirt was dark with sweat. He was tired, but there was a gleam of satisfaction in his sharp black eyes and a kind of grin on his wrinkled face.

The battered canvas bag in which he kept his tools and records was slung over one shoulder. He slapped at his thighs and puffs of dust spurted from his trousers. He took off the shabby felt hat which he always wore, and his thin gray hair was damp and draggled. He came over to the table, fumbling with the buckle on the bag. I watched his knotted fingers wide-eyed, for I had seen them pull many wonders out of that dusty wallet. I can hear his triumphant chuckle as he drew out a knife—*the* knife—and tossed it ringing on the table among the sherds.

You've seen it, of course. It's been in the pictures many times, and there are solidographs of the thing in most museums. I saw it then for the first time—ever—in our time.

He hadn't washed it. There was dirt on the fine engraving of the dull-black hilt, and caked in the delicate filigree of the silver guard. But the blade was clean, and it was as you have seen it—cold, gleaming, metallic blue—razor-edged—and translucent.

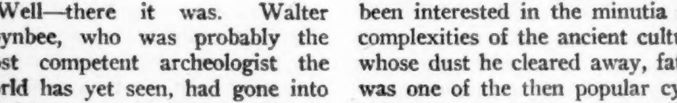
Maybe you've had a chance to handle it, here in the museum. Where the blade thins down to that feather-edge you can read small print through it. Where it's thicker, along the rib that reinforces the back of the blade, it's cloudy—milky looking. There has been engraving on the blade, too, but it has been ground or worn down until it is illegible. That is odd, because the blade is harder than anything we know except diamond. There is no such metal in the System or the Galaxy, so far as we know, except in this one well-worn and apparently very ancient knife blade.

It must be old. Not only is the engraving on the blade obliterated by wear; there is the telltale little serif near the hilt, where that utterly keen, hard edge has been worn back a little by use and honing. The black stuff of the hilt looks newer, and the carving is clearer, though still very old. Grandfather thought that it was made of some very heavy wood, possibly impregnated with a plastic of some sort, and that it had been made to replace an earlier hilt which had become worn out or broken. The metal of the guard and the plate and rivets which hold the hilt are ordinary silver, in one of the new stainless alloys which were just then coming into fairly general use.

Well—there it was. Walter Toynbee, who was probably the most competent archeologist the world has yet seen, had gone into the future in a Malecewicz shuttle. He had dug up a knife, and brought it back with him. And it was made of a material—a metal—of which our science knew absolutely nothing.

Three days later Walter Toynbee was dead. It may have been some virus picked up in that distant future which he had visited, to which our generation of mankind had developed no resistance. It may have been the strain of the trip into time, or the excitement and exertion of what he did there. He washed up, and we went home together to supper. We had it together, in the kitchen, because the family had finished and the dishes were done. Father examined the knife while we were eating, but he wouldn't talk about it then. He was tired: he wanted to sleep. He never awoke.

In my father, old Walter's only son, the family talents had taken another turn. He was a more practical man than his father, and had done his noted parent many a good turn by husbanding and stimulating the family fortunes when they most needed it. Where grandfather had been interested in the minutia and complexities of the ancient cultures whose dust he cleared away, father was one of the then popular cyclic historians who tried to see civilization as a whole—as a kind of superorganism—and to find recurring patterns in Man's gradual progression from the jungle to Parnassus. I am not implying that old Walter had no interest in synthesis and generalization—it is, as a matter of fact, a tradition that he had adopted the name Toynbee out of admira-



tion for an historian of that name—a scholar of scholars—who lived and wrote in the early years of the last century. There is a letter among his papers which suggests that our original patronym may have been Slavic. If so, it might also explain his long and warm friendship with the unfortunate Malecewicz.

Be that as it may, grandfather's death set in motion events whose result is all too familiar to all who have chosen to identify their lives with the pursuit of archeology. By the time the public lamentations had begun to die away, the press found a new sensation in the knife. The experts mulled over it and reported with remarkable unanimity that the engraving on the blade and hilt, while clearly of the same provenance, resembled no known human script or style of decoration. Finding their progress blocked, they called on the metallurgists and chemists to identify the blue metal of the blade, and on the botanists to specify the wood—if it was wood—of which the hilt was made.

Need I continue? There was more quibbling for its own sake in those days than there is now. Every expert was jealous of his personal acumen and insistent upon being the Only Right Man. It was considered fitting and proper that experts should disagree. But it gradually dawned on everyone concerned that here was something where there could be no disagreement, and what was more, something which might very well open new vistas of human progress.

Physically and chemically the blue stuff was a metal, though it was no metal chemistry had ever described or imagined. When they had succeeded in sawing out a sliver of the blade for tests, and finally got it into solution, its chemical behavior placed it quite outside the periodic system of the elements. The physicists went to work on another sample with X rays and spectrographs, and arrived at much the same result. The more they studied it, the less they knew, for sooner or later some experiment would succeed in knocking over any hypothesis which they might have built up on the basis of their previous investigations.

Out of it all eventually came the judgment which stands today: that the blue stuff might well be some familiar metal, but that its atomic and molecular structure—and consequently its physical and chemical properties—had been modified or tampered with in a manner unknown to our science, making it to all intents and purposes a new state of matter. The botanists returned the same report. The black material had the structure of wood, and it might be any of several common tropical woods or it might be something quite alien, but it, too, had been hardened—indurated—through internal transformations which left it something entirely new to our planet.

That ended the first stage of the battle. When the experts threw up their hands in despair, the attack shifted to another quarter. The knife came back to my father, and he promptly made it the nucleus of a Toynbee Museum of Human Acculturation at his and Malecewicz's university, where it is today. But it was common knowledge that old Walter had brought the thing from the future. That meant that somewhere in the coming centuries of our race was a science which could create such unheard of things as the blue metal, and that the stuff was sufficiently common with them for knives to be made of it. Its electrical properties alone were such as to open a host of possible uses for it—father had been offered a small fortune by a certain great electrical concern for the material in the knife alone—and science decided to visit that future civilization, learn its secrets, and profit suitably thereby.

So the experiments shifted to time traveling. Malecewicz' notes were unearthed again and published; Grandfather's shuttle was dismantled and reconstructed a dozen times; Balmer found himself in a position to charge almost any fee as a consultant to industrial laboratories, universities, and private speculators who were hot on the trail of tomorrow. Shuttles were built on every hand, and men—and women—disappeared into the future. One by one they straggled back, empty-handed and thoroughly disgruntled. The future had no such metal.

There was a brief period in which everyone who had failed to solve the problem of the knife tried to cast doubts on Walter Toynbee, but the thing existed, its nature was what it was, and presently the hubbub swung around full circle to the place it had started. Grandfather had been an archeologist. He had gone into the future, and excavated the knife from the detritus of what might conceivably have been a colony or a chance visitant from another world—even another galaxy—someone—or something—of which the rest of humanity at that moment in time was quite unaware. Archeology had found the thing. Science craved it. It was up to archeology to find it—or its source—again.

So we became, in the language of the popularizers, the Mother Science—spawning off all sorts of minuscule specialties, lording it over a score of devoutly adulatory slave sciences, enjoying our position and taking every advantage of it.

I grew up in that atmosphere. From the time I could talk and listen, Grandfather had filled me with the wonders of the past and the romance of their discovery. Now the whole world was awake to the glories of archeology as the science of sciences which would open a whole new world to struggling Mankind. Is it any wonder I chose to follow in my grandfather's footsteps?

Let me say now that men like my father and grandfather, who had needed no world-shaking anomaly to intrigue them with their chosen study, never lost their heads in the storm of recognition which swept over them. It might have been better if they had. Archeology was in the saddle; very well, it was going to ride—and ride hard. Projects which had been tabled for lack of funds were financed in a twinkling. Tools and instruments of investigation which had been regarded as extremists' pipe dreams were invented on demand. With new tools came new techniques, and with new techniques came a hierarchy of skilled technicians, statisticians in place of explorers, desk work in place of excavation, piddling with detail instead of drawing in broad strokes the panorama of advancing civilization which men like Schliemann, and Evans, and Breasted, and that first Toynbee—yes, and old Walter Toynbee after them all—had seen with clear and understanding eyes.

We have no one to blame but ourselves. I fully realize that. We dug our own hole; we furnished it lavishly; we built a wall around it to exclude the non-elite; we arranged to be fed and comforted while we dawdled with our trivia; and then we pulled the hole in on top of ourselves. We wore a rut so deep that we can never climb out of it. So I dream of cutting my grandfather's throat instead of realizing that if I were the man he was —if I had the courage to break away from the stultified pattern I have helped to make, and go primitive, dig in the dirt with a trowel, regain the thrill of new worlds—the barriers would disappear and I would be free again, as men were meant to be.

Of course, by the time I was old enough for the university the whole business was well under way. My father, with his cycles in mind, had instigated a project whereby Archeology—it rated the capital by now—would uncover and describe the entire growth, maturity, and decline of representative communities, our own included. A colleague—or maybe he was a competitor—at Harvard was all for starting all over again at the beginning and redigesting the entire corpus of archeological data accumulated by grubbers since the beginning of time, using the new statistical attacks and the college's vast new calculating machine. He got his money. Science had declared that Archeology was the magician which would presently pass out unbounded benefits to one and all, and one and all swarmed to get on Santa Claus' good side.

I served my apprenticeship doing the dirty work for the men who voyaged into the future and sent back reams and sheaves of notes out of which we desk-workers were supposed to pull blue metal rabbits. This was the era of specialism: when trained mechanics did the digging, when stenographers and solido-scanners took the notes, and when laboratory drudges squeezed out of them every possible drop of information which super-statistics could extract.

I remember the worst pest of

them all—a man with as much personality as my grandfather, though of a different kind—who nearly imposed his infernal pattern on the science for a generation. He had been a mathematical physicist who turned to archeology in what he claimed was an attempt to fit human behavior "in its broader sense" into some set of universal field-equations he had distilled out of his stars and atoms, and which purported to express the Totality of All, or some such pat phrase, in a large nutshell.

Of course, any such over-view of civilization was music to my father's ears, and he gave the man the run of the Museum and a voice in all our activities. Hill—that was his name—at once announced the precept that it was quite unnecessary to *find* blue-metal knives in some future culture. By making a sufficiently exhaustive collection of data at any particular moment, and applying his field equations in their humano-cultural aspect—I am trying here to recall his jargon—it would be possible to predict accurately when and where such knives *must* be.

Hill had a shock of red hair, a barrel chest, and a loud voice. He spoke often and in the right places. Myriads of miserable students like myself had to mull over the tons of notes which expeditions under his direction sent back. We translated facts into symbols, put the symbols through his mill, and got out more symbols. Nine times, by count, he announced to the world that "now he had it"—and nine times by count a simple check-up showed that the poor beleaguered natives of whatever era it was he had chosen as It had never heard of such a metal. Some of them had never heard of metal.

By the time I was twenty-three and had my own license to explore past and future indiscriminately, we had a pretty good overall view of the future of humanity. We had libraries of histories which had been written in millennia to come. We had gadgets and super-gadgets developed by future civilizations, some of which we could use and most of which we were able to misuse. The world we supposedly enjoy today was in the making, and you all know what it is like.

I had done altogether too well at whipping the esteemed Dr. Hill's hodgepodge of miscellaneous data into some semblance of intelligibility. The powers that were—and are—announced that I might spend the rest of my life, for the good of Humanity, fiddling with the same kind of stuff. But I was young, and I was a Toynbee. I stood up and demanded my rights, and they gave them to me. I could go out like all the rest and hunt for the knife.

I am not a fool. Moreover, I had had the advantage of knowing my grandfather—better even than father ever did. I knew how he would think and how he would react. He was the kind of man who went at things hard—all out—to the limit of his ability. It seemed clear enough to me that the first step in finding the knife was to determine what that limit was—although in thirteen years or so nobody had chosen that approach.

Balmer was still alive, and I made him dig out the plans and specifications he had drawn up when he made grandfather's shuttle. I got hold of the notes the experts had made when they tore the machine apart after his death, and they checked. And then I had Balmer set me up just the same kind of old gray cube out of which Walter Toynbee had stumbled that day, with the blue knife in his dusty old ditty bag.

It was bigger, of course—I had to have room for the kind of equipment a field man considered necessary in my day. I'd never had any training or experience with the kind of work old Walter did with his own two hands, a camera, and a trowel. The profession had been mechanized, and it was silly not to use the best I could lay my hands on. The time field, though, was the same, and it should carry me just as far as it had carried its originator thirteen years before.

It did. Malecewicz, by stretching his original model, had been able to get fifteen years out of it. Grandfather's huge old vault of a machine lofted him nearly twenty times as far into the future of our race—and of our town. As I had suspected from the specifications of the machine, it dropped me somewhere near the middle of that interregnum which followed the Hemispheric Wars, when half the cities in America had been reduced to rubble, disease and famine had put the population of the planet back into a hunting-fishing-food-gathering economy, and all that remained of civilization was a memory which would some day be revived, restored, and started off again.

I am not saying that in thirteen years of trying nobody had hit upon this particular period in the future. It is true that having hit it they let common sense scare them off. It was obvious that that level of culture could never produce so sophisticated a scientific marvel as the knife. There was no evidence in the ruins they found to show that our own culture, up to and during the time of the Wars, had done so. Ergo: onward and upward. Try another thousand years. Try a million.

I had a slightly different point of view on the matter. I knew grandfather. He would go as far as his machine could take him. I had duplicated that. He would look around him for a promising site, get out his tools, and pitch in. Well, I could do that, too.

There is enough uncertainty—backlash, if you want to call it that—in the operation of any time shuttle so that you can never be certain that you will hit any specific moment or even any specific day or week in the future. Put that down to mechanical imperfections, if you like—I know some do—but I consider it a matter of the inexactitude of the physical universe, and I doubt that there is ever anything that we can do about it. You can approximate—hopping back and forth across the time you want until you get reasonably close—but that is a makeshift solution, borrowed from practical mathematics. I didn't try.

If you've read your history of the next five hundred years, you'll know that the gas attacks toward the end of the war had stripped the Atlantic coastal regions of vegetation and every other living thing. I got out of the shuttle in a dusty landscape where the bare bones of the planet stuck up in shattered stumps in a wind-swept desert of gullied clay. I might be ahead of my grandfather's time—in which case I saw a paradox brewing—or I might be following him. As it turned out, it was the latter.

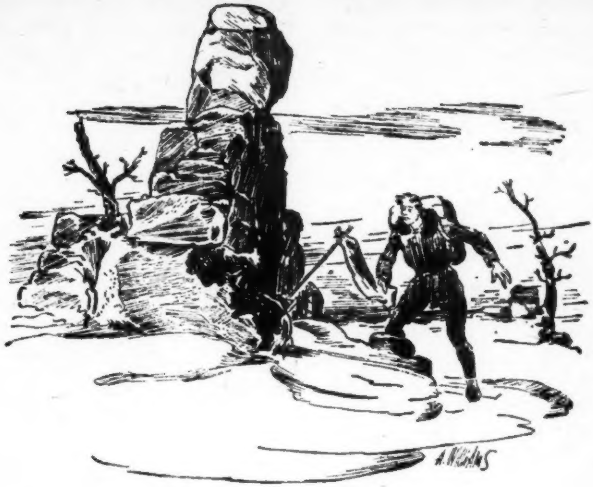
I knew from what others had learned that there was no life in this coastal strip until much later. Gradually vegetation worked its way into the arid strip, insects and mammals followed, men followed them—but this is no essay on the future. There was no point in hunting for survivors; Grandfather certainly hadn't. For on all sides stretched the wreckage of our own city—or its counterpart of three centuries from now—and I knew that he would have stood just as I was standing, looking it over with an appraising eye, wondering where to begin.

One mass of fallen masonry, half submerged in a drift of sand, towered higher than the rest. It would provide a vantage point from which to size up the situation. As I plodded toward it through the soft sand I found myself watching for his footprints, so certain was I that this must be the place and the time. It was nonsense, of course; my own tracks were filling in as the wind curled sand into them.

Then I saw it—and that day thirteen years before came rushing back to me. Of course there would be traces! Walter Toynbee would never in his life have abandoned a dig as promising as this—a dig where surface-scratching had yielded him a relic like the knife. But for his sickness and death he would have been planning a return expedition—a camp—a full-scale attack. Not half the equipment he had taken with him was in the shuttle when he returned. And there, at the eastern base of the mound, the tatters of a red bandanna whipping in the wind, a short-handled shovel was driven into a crack in the masonry.

I fingered the shreds of red cloth. It was his. He always had one stuffed in the pocket of his jeans. Duster—sun shield—lashing—he had a score of uses for them. Any field worker had in those days, before there was a tool for every purpose.

The crevice into which the shovel had been wedged widened as it went down. Sand had drifted into it, filling it to within a few feet of the top. By all the tenets of civilized archeology I should first prepare my aërial plan of the entire complex of ruins, erect the light tower with its instrument board to establish a zero reference plane for the solidograph,



and assemble the scanner. When a grid had been projected on the screen of the excavator, it would be time enough to think of beginning the actual investigation.

Do you believe in ghosts? As I stood there, with those shreds of faded red cloth in my hand, stroking the sand-polished handle of the shovel, I suddenly realized that so far as time itself went he might have been standing here only hours, or even minutes before me. It was as though he had turned his back for a moment, and I had stepped into his tracks there in the sand. I was a child again, tagging after him as he strode around the big laboratory with his giant's strides, pulling down a book here, running through a file of negatives there, gathering his tools around him before he set to work to unravel some perplexing situation in his digging. A thin cloud passed across the sun, and it was as though his shadow had fallen on me.

I pulled the shovel out of the crack in which he had wedged it. It was in good condition—perfectly usable. In my time we did not work with shovels or picks, but any fool could handle the thing. I dug it into the sand—scratched at the base of the crack. It would take only a few moments to deepen it enough so that I could crawl inside.

There was a kind of satisfaction to the work. I exercise in the public gymnasia—all young men of my age have to, to keep fit—but there was a difference. Using this primitive tool brought with it a feeling of accomplishment—of purpose—that I never found in mere exercise. I was strong, and it gratified me to see the hole deepen and the drift of sand grow behind me. Soon I had a tunnel into which I could crawl without bumping my head. I went back to the shuttle for a glow lamp and a pocket scanner, and plunged into the darkness.

After the first few feet I had no use for the lamp. My eyes grew accustomed to the dark, and I saw that shafts and streaks of light broke through gaps in the ruin overhead. Presently I found a hard floor under my feet, and then I came out into a room which was like a wedge—the ceiling fallen in one mass which hung diagonally between the wall over my head and the floor about twenty feet before me. Sunlight seeped in through a crevice to the left, striking on the wall and filling the whole place with a kind of diffuse glow. In that glow I saw footprints in the thick dust which covered the floor, and the table to which they led.

They were his footprints, of course. On that table he had found the knife. I stepped out of the doorway where I had been standing, an odd feeling of familiarity growing in me. I crossed the floor to the table. It had been covered with heavy glass, which lay in shreds on the dusty bronze. I could see the marks of his fingers in the dust where he had moved the broken glass aside. And I could see the outline of the knife, as sharp in the unstirred dust as it was when he picked it up in his gnarled old fingers thirteen years—or was it thirteen minutes?—before.

The crack of light was widening as the sun moved; the place grew brighter. I brushed the dust away from the table top. It was heavy bronze; it told me nothing. And then, turning, I saw the opposite wall and the frieze in low relief which ran above the door—

I don't like the impossible. I don't like paradox. I sit here, toiling over my correlations—they have promised a machine by spring which will perform them for us more quickly and in far more detail than we have ever attempted—and when I grow tired I let my head slip down on my hands, and I dream of a day when I was a child. I dream of an old man and a knife—and murder.

I had had my chance. Others, more experienced and possibly more capable than I, followed me. The entire ruin was excavated, with the most meticulous attention to technique, down to bedrock. And I . . . I was sent back to my correlations and my trait tables, to work up the data which other men would presently send me. Because strive as they will, they can find no other explanation than the one which—to me—seems obvious. The answer which is no answer—

You can go into the Toynbee Museum now, today, and see the knife in a guarded case, in the anteroom of the main exhibit hall. In the course of three hundred years that case will have been replaced by a bronze table and a cover of heavy glass. Bombs will fall, the building will crumble in ruins, and the knife will still be there. Dust will cover the ruins, and one day a gnarled old man in shabby clothes will shovel it away and creep inside. He will find the knife and carry it away. Later a younger man will come—and then others—many others, men and women both. And all the while, on the granite lintel above the door to the room where the knife is kept, will be the inscription:

WALTER TOYNBEE
1962—2035

My grandfather brought the knife back from the future. He died. It was placed in the museum named for him. It lay there for three hundred years, while the human race went mad trying to solve its secret—while all civilization was turned upside down in the search for something which never existed!

He found it in the museum where it had always been. He carried it back through time, and it was placed in that museum. It lay there until he came and found it, and carried it back through time—

It was a simple pattern—as simple as ever was. Must we think only in terms of a beginning and an end? Cannot a thing—even a person—exist in a closed cycle without beginning or end? Appearing to us now, at this level of our time thread, accompanying us down its extension into our future, then vanishing from our stream and circling back to the point where it appeared? Can't you imagine that?

I thought I could. I thought it was a paradox—no more—as simple to explain as ever was. I was wrong, of course, and they are right.

The knife old Walter Toynbee brought back from the museum built in his honor, to house his knife, was perfect—worn, dirty, but perfect. A little notch was sawed in the back of its translucent blue blade—sawed with a diamond saw, to provide the chemist and the physicists with the samples they needed to test its properties. That notch is still in its blade as it lies out there in the museum case—it will be there for the next three hundred years, or until the raids come and the museum falls in ruins. Until an old man comes out of the past to find it—

The knife old Walter Toynbee will find there in our future will have that notch. The knife he brought back to me thirty years ago had no notch in it. Somewhere the circle must have a beginning. Somewhere it must have an end—but where, and how? How was this knife created, out of a strange blue metal, and a strange, black, indurated wood, when its existence has no beginning or end? How can the circle be broken? I wish I knew. I might not dream of murder then. I might find logic and purpose in the future instead of chaos—instead of impossible worlds that never were.

THE END.

The Leech

by Malcolm Jameson

He had need of only one invention; thereafter, any invention, any wealth, any action he wanted carried out was his to command—

Illustrated by Orban

THE first premonition of trouble came to Cranborne when Jim Skelly shot at him.

It is always disconcerting to be shot at unexpectedly, but especially when the shooter is a trusted employee and friend, and a crack shot as well. But as it happened, Skelly missed. Cranborne's reflexes were too fast for him. There was also the impression that somehow Skelly managed to pull his punch at the very instant of firing.

It occurred in the morning, at the main gate of the Cranborne Labs. Skelly was on guard and Cranborne was driving in on his way to work. And then, just as Cranborne nodded good morning, he saw Skelly whip his gun out. His face was strangely contorted, like that of a man doing a set of calisthenics that taxed his strength, for it was red and twisted and registered pain and indignation rather than anger, but his arm came up nevertheless. Cranborne ducked just as the trigger was pulled, and when the bullet crashed through the windshield he rolled out of the car on the far side and gathered himself for the dash on the watchman.

By the time he rounded the rear of the car, two engineers coming to work had grabbed Skelly and disarmed him. Skelly was struggling with them, protesting it was all a mistake and he could explain everything. The pistol still spun on the ground where it fell. From then on everything was anticlimactic.

"For Pete's sake, Jim," demanded Cranborne in amazement, "what's got into you? Are you drunk or crazy?"

"Crazy, I guess," said Skelly sheepishly, as the men pinning him let his arms go and stood away. "Like those other nuts we've been hearing about. I swear by all that's holy I didn't mean to and tried not to, but to save me I couldn't help that arm from coming up and pulling the trigger. It was like being in a dream. Something outside of me that was stronger than I was making me do it."

Cranborne simply looked at him. Skelly's record was spotless, and to challenge his personal loyalty was unthinkable. Twice during the war just finished he had thwarted Nazi spies in attempts to sabotage the labs, killing five in single-handed fights against odds. And as he spoke now there could be no doubt of his sincerity. The act *had* been a compulsive one—motiveless, unpremeditated and irresistible. Cranborne picked up the gun and handed it to him.

"All right, Skelly," he said. "Forget it."

While he was parking his car alongside the small office building, Cranborne thought of the incident in connection with the wave of similar ones Skelly alluded to. He was trying to fit the latest occurrence into a pattern with the rest. Except there was no pattern. There was just a jumble of unrelated impulsive acts, mostly of a foolish nature. Their appearance was sporadic, random, and whimsical. Psychologists attributed them to post-war hysteria and said it was a compensatory letdown of inhibitions forced on the public by the war. The police, on the other hand, contended that most of the episodes were the work of practical jokers, utilizing the current press publicity as an excuse for their pranks.

Cranborne considered both theories and decided neither made sense. There was the case of the ferry captain, for example, a staid man of unblemished record. At the end of his run, instead of docking his boat in the slip, he went on down the river and out to sea, heedless of the angry protests of his unwilling passengers. It was not until a coastguard cutter overhauled him and tore him away from the wheel by force that he desisted. Then he broke down and actually wept. He said he could not help it. Some inner force made him do it, and though he resisted with all his might every mile of the way, simply had to carry on. Then there was the instance of the notoriously greedy moneylender who sent out notices to his debtors that they might regard their accounts as paid in full. He repented almost instantly and tried to retract, alleging he had been under some kind of alien influence at the time. And so . . . but there were many such cases, all more or less silly and innocuous. But the one characteristic they had in common was that the perpetrators invariably pleaded compulsion from some mysterious outer force.

Cranborne mounted the steps to his office. Cranborne Labs was a small plant, but well laid out for its work. Its work was invention. To the right lay the technical buildings, where chemists, physicists and engineers did research. To the left lay the shops, where models were built and tested. It was Cranborne and his detailer Gibson who knitted the whole together, and they held forth in a tight little building of their own, assisted only by a secretary.

By the time Cranborne reached the door of his office he had decided to put the Skelly affair from his mind. Since an epidemic of momentary madness seemed to be abroad in the land, it was no more than to be expected that sooner or later it would reach his outfit, though admittedly the Skelly outburst was of a more dangerous nature than the others. And then he turned the knob and walked into Miss Nevers' office, which lay outside his own.

It was full of acrid smoke, and at one end a fire of torn papers blazed. Miss Nevers knelt nearby it, surrounded by stacks of letters and carbons. The wide-open drawers of the file cases lining the walls told where they came from. The girl was sobbing spasmodically, but as she sobbed she was rending the letters into scraps and feeding the scraps to the fire. If Cranborne had been startled by what happened at the gate, his feeling now was blank amazement. For here was a case of hateful compulsion in continuous motion.

He yelled at her, and grabbed her up from the floor. She gasped once—a curiously mingled gasp of fright and relief—and collapsed in his arms, only to burst into a fit of uncontrolled weeping. He crossed the room swiftly and laid her on a couch. Then he snatched an extinguisher off the wall and went about putting out the fire. After that he opened the windows and surveyed the damage.

The building was none the worse for it, for its floors and walls were concrete and its furnishings metal. But he pawed through the charred scraps of papers ruefully. They were all that was left of a voluminous correspondence with the patent office and a number of industries in relation to licenses and royalties. The inconvenience their loss would cause would be vast, and the monetary cost incalculable, for many of the papers missing were important, since they dealt with matters pending.

Meantime, Miss Nevers had gained some control of herself. Now she was wailing in self-upbraiding. She had done a hideous, an awful, an inexcusable thing, and she was going to end it all. But she couldn't help it. Something made her—it was like being under the influence of a drug—and now she was disgraced and wanted to die.

"Now, now," he soothed, "don't let this get you down. It is happening all over town, and you just happened to be the next victim. No real harm has been done. There is nothing here that Gibson or I can't replace from memory."

"O-o-oh," she moaned, and went off into another spasm of self denunciation. But after a little he calmed her with assurances, and told her she was obviously suffering from overwork. At length her sniffings stopped and she agreed to go away and take a short vacation. Cranborne saw her out the gate, and then summoned the janitor to finish cleaning up the mess. By the time Cranborne was ready to cross the hall to the drafting room he felt he had already done a full day's work.

Gibson did not acknowledge his greeting, but went ahead with what he was doing. Cranborne spoke again, but Gibson did not seem to hear him. Cranborne shot him a curious look, then perched himself silently on a stool in a corner to watch. For clearly something was wrong in here, too. Gibson's preoccupation with what he was doing was only the first symptom that caught the eye, for he was not a fellow to lose himself completely in concentrated thought.

To begin with, the vault was open. The significance of that was that only Cranborne knew the combination, an arrangement agreed upon by common consent of the associates. The vault contained drawings for hundreds of inventions not yet released for patent or sale, economic uncertainty after the war being what it was, and their potential value ran into millions. A leak could be very costly. So, to limit responsibility, Cranborne only was to have access to the vault. And yet it was open?

How? By Gibson, obviously, since he was dragging rolls of drawings from it. But where did he get the combination? It was locked in Cranborne's head, never having been committed to paper.

Another disturbing feature was that Gibson was examining minutely the plans for a station to transmit electric power on tight beams, one of the most jealously hoarded secrets of the Cranborne Associates. It was no secret to Gibson, of course, but what bothered Cranborne was the zombielike behavior of his chief assistant. He acted like a man in a trance, going about with an absolutely deadpan face. The only live thing about him was his eyes, which bored eagerly into the sheets before him as if they had never seen one of them before. Yet Gibson, as draftsman, had executed them all! And then, from time to time, as if to fix some detail in memory, he would snatch up a pad and sketch furiously, only to crush the sketch and hurl it into a wastebasket.

Cranborne stood it as long as he could, and then went over and shook the man.

"Hey," he yelled, "snap out of it! Are you hypnotized, or what?"

"Huh?" said Gibson, stupidly, lookingly blankly up at him. Then, not slowly, but with startling abruptness, Gibson came alive.

His reaction was about that of a sleepwalker suddenly awakened in an unauthorized place. He started violently, passed his hand agitatedly across his eyes, blinked, and mumbled a question as to where he was. Then he sat trembling for a minute, staring helplessly at Cranborne. His eyes roamed over to the clock on the wall, and he started again.

"Two hours," he said weakly.

Cranborne waited.

Gibson glanced at the tracings spread out on the table, then toward the yawning vault door.

"I did it", he said, simply, "but I don't know how or why."

"Go on," said Cranborne grimly. "Tell me all about it. Especially how you felt."

"How I felt?" echoed Gibson blankly. "Why, sort of numb and helpless, like I did once when a doctor gave me a heavy shot of morphine. It happened to me just after I came in. Something compelled me to go over to the vault and open the door—"

"How?"

There was a hardness in the tone.

"I don't know how. My fingers did it. *I* wasn't there, so to speak, but somewhere off in the back of my head. I don't know what the numbers were, or anything."

"Go on."

"Well, I went on taking drawings out, looking at them, and putting them back again. I don't know how many. Or which."

There was a long, painful silence. Cranborne was frowning, and Gibson plainly scared.

"I suppose this washes me up," said Gibson hesitantly. "I wouldn't blame you if you thought—"

"I'm not thinking anything," snapped Cranborne, "but I'm doing a lot of wondering. Skelly tried to kill me as I came in. Miss Nevers has just burned the patent files. Now this. It is beginning to look as if someone was out to get me, and is employing you as tools."

"Oh, not that," Gibson cried out in anguish, "you know—"

Cranborne shook his head.

"I know all of you. And I trust you to the hilt. Still. But I believe what I just said. You are being *used*. How, I don't know. Nor why. Nor by whom. But the answers to those questions are our No. 1 priority from now on."

They were interrupted by the ring of the telephone. Cranborne took it. It was McKeller, their legal associate, calling from Washington.

"Say, Steve," were McKeller's first words, "there's something down here with an awfully putrid smell. The patent office says no go on that new superplastic process.

Some skunk has beat us to it, and that's not the half of it."

"Keep talking," said Cranborne, wearily.

"I saw the drawings on file and the rest of the dope. Get this. *They are exact reproductions of ours*—to the umptieth decimal point and to the comma. The only difference is that they were filed three weeks before ours."

"By whom?" demanded Cranborne, now really upset. The superplastic idea was already as good as sold, and the price ran into six figures down and royalties without end. Cranborne Labs needed every cent, for throughout the war they had worked exclusively on war weapons, handing everything to the government gratis.

"That's the funniest part of it," replied McKeller. "The patentee is a guy named Joaquin Jones. Remember him?"

Cranborne cursed vigorously. He did.

"Why, that big lummox couldn't invent a better mousetrap," he concluded, "and anyway, I kicked him out of here five years ago. *He* couldn't have stolen the idea, if that is what you mean."

"Somebody sure did," insisted McKeller ominously. "You had better do a little checking around where you are. There's a leak."

"Thanks," said Cranborne simply, and hung up. There must be a leak, but it was no ordinary leak, he was sure of that. The entrance of Jones' name into the picture was proof enough of that.

Joaquin Jones had come to him early in the war period, well equipped with references as to character and bearing a diploma from an outstanding scientific college. He was a good-looking, matinee-idolish sort of fellow, but much too dumb and easygoing to ever make a name for himself in a high-powered organization such as Cranborne Associates. Cranborne stood him just two weeks and then let him go. It was a routine incident, and easily forgotten. But Jones could not have been a spy, for at that time the superplastic process had not been so much as thought of. Nor was it conceivable that anyone would use him as a go-between for a stolen invention. He was too inept. The last Cranborne heard of him was that he had settled down as a draftsman in a third-rate architect's office.

"Well," said Cranborne, turning to Gibson, "the superplastic deal is shot. Somebody stole it. And since it may be that all the other stuff we have in the vault is compromised, we'll have to think up something new for ready money."

"What do you mean, compromised?" asked Gibson, still tingling with embarrassment from having been found sleepwalking outside a mysteriously opened vault.

"Look," said Cranborne, "we are high-grade adults, you and I. We can stare an unpalatable fact in the eye and admit it's there. Somebody—and it wasn't you or McKeller or Miss Nevers—had access to those drawings months ago, yet they were never out of the vault until the day we sent them off by registered mail to Washington. Therefore someone has been in the vault and could have seen everything. Now as you know, that vault has a very special lock of my own contrivance that has defied the best safe experts of the country. Yet you opened it this morning without knowing how, or that you were doing it. You were in a daze, under alien control. The same thing may have happened before. It may have happened to me. How are we to know? I am beginning to think we are up against something pretty uncanny. And pretty ominous. My hunch is that we are going to have to work fast from now on if we are going to hold our own."

"Maybe you're right, chief. I'd bet my last dollar on your intuition."

He meant it. Cranborne was no great shakes as an engineer and less of a scientist. But he had the happy knack of being able to look at a lot of jumbled facts and see what would happen if they were hooked together in a certain unorthodox way. The business of the Cranborne Associates was to dig out bizarre facts; it was Cranborne's job to mull over them and come out with a startling invention. Nobody could analyze his methods, least of all himself.

"All right, then," said Cranborne, "let's get going. Trot out those rough notes on the stereoscopic televisor and I'll take a fling at it. I had a dream last night."

In a few minutes the queer happenings of the morning were forgotten. Cranborne promptly immersed himself in dreamy thought, letting his mind roam as it would. Twice he started forward, then slumped back.

"Hell, Gibson," he said, suddenly, "I don't know what we've been waiting for. Grab a pencil and sketch pad. Look, it is as simple as this—"

A diagram swiftly took form.

"See. Stick a bank of omegatron tubes here, lead in your booster circuit there. Now a tripolar condenser here—"

"Oh, sure," grinned Gibson, "I've got it now. And if you add this gadget to the hook-up," and he sketched in more detail, "you kill static, cut out distortion, and can add odor sensations if you want. It'll be a lulu."

"Good work," said Cranborne, and sat back to watch Gibson develop the idea.

Minutes rolled by in silence as the sketches for the finished drawings grew. The silence was broken when Gibson broke off to look up at his chief as if expecting some sign of approval.

"Say, chief," he cried out, appalled, "what's wrong with *you* now? You look like—"

It was like a dash of ice water. Cranborne started as if pricked with a pointed electrode, for tingling thrills rippled his scalp and he felt the short hairs on his neck stiffen and rise. His muscles were cramped and his eyes felt as if they were starting from their sockets. He suddenly realized that he had been staring fixedly for unknown hours at something he had not seen except remotely. He had the weird feeling that somebody else *had pushed him out of the way and was looking through his eyes.*

With considerable effort he broke himself out of the rigid pose he found himself in. Then he got up and walked over to the wall, where he stood a moment with his nose pressed against the blank surface. In a moment he felt normal again, but slightly weak and dizzy, as if having just come out from under the influence of an anæsthetic.

"Something had hold of me, too," he explained to his anxious partner. "Now that I've experienced it myself I know my hunch is right. Either an intellect of undreamed-of power is loose in the world, bent on some purpose of its own, or—"

"Or?"

"Or that devilish thing, the spy ray, has been invented."

"Now we're *all* nuts, chief," laughed Gibson, but uneasily. "You worked on one once and we nearly went crazy? Remember? You said then the thing was demonstrably impossible."

"I know. But that was because we clung to the electronic approach. That track leads nowhere. We should have tackled telepathics. What better spy ray would you want than the ability to look into another man's mind? It is true that you couldn't see through concrete and steel into a closed vault, but you could transmit the impulse to your agent and make him open it for you and see what was there."

"I don't know," objected Gibson. "It sounds good, but it doesn't gibe with what we know about telepathy. Telepathy is an uncertain phenomenon. It occurs in a limited number of people, and is weak and erratic when it does. Nobody yet has been able to control it consciously. Take your hunches. They're good, we all admit. But can you turn them off and on? No!"

Cranborne admitted grudgingly that that was right.

"After all," pursued Gibson, bucked up by his minor triumph, "what is telepathy but long-range sympathy? You won't agree that if somebody is making us steal our own ideas for his benefit that we are in sympathy with us, would you?"

"You are splitting hairs now, Gibson. There are a lot of sympathies other than idealistic ones. Or emotional. Certain mental powers can be transmitted by those who know how, willy-nilly. It has been done, though not as scientifically as I would have liked. Do you recall back in '43 when there was a fellow on the air who claimed he could hypnotize by radio at any distance? He had some fool theory that that was the secret of Hitler's power. Nobody took him seriously, but I think there is the germ of an idea there."

The conversation went no further. At that moment Faber, the biological research man, rushed in, angry and excited. He waved a newspaper wildly.

"This burns me up!" he shouted. "Read it!"

It was the afternoon edition of the *Daily Enquirer,* owned and edited by one of Cranborne's buddies, Max Hartwell. They had had dinner together only the night before. But there was nothing friendly about what was printed on the first page of today's issue. For under screaming headlines a signed editorial replaced the usual quota of news items.

THE "GREAT" INVENTOR EXPOSED!

How Brainsucker Cranborne Gets Away With It!

The text was a mass of scurrility, as venomous and libelous an attack as was ever penned. It described the Cranborne Labs as a place where bright young scientists were lured and tricked into signing away their intellectual futures, after which they were kept in a state of mental peonage. Stephen Cranborne was denounced as a ruthless exploiter, and the editorial went on to cite instances. There followed an astonishing exposé of the institution, describing many of the better-known inventions and stating just who played what part, though all the patents had been issued in Cranborne's name. There was much truth in that portion, though it was not also told that the contributors received their proportionate share of the profit. What hurt was the mass of falsehood interwoven with it. Fully half of the famous processes, the paper alleged, had been originally conceived by the greatest and least recognized figure of modern science—Joaquin Jones!"

"This is outrageous," growled Gibson, who was reading over Cranborne's shoulder. The last paragraph had completed with the assertion that even now the Cranborne vault was stuffed with unreleased inventions pirated long ago from the said Jones.

Cranborne stared at the sheet glumly, and his hands shook a little.

"Gentlemen," he said, "this is bad, and I do not pretend to understand it. But what is behind it is worse. Max Hartwell would go to hell and back for me, and now he's done this. But I know one thing, it was not his doing. He was manipulated by some malign force. But wait—"

He reached for the phone, but before his hand touched it, it rang.

"Cranborne?" came the voice. "This is Smithers of the *Enquirer*. I want to explain that editorial."

"It needs it," was Cranborne's grim reply.

"We can't understand what happened, but we're doing our best to rectify it. Boys are out trying to pull in the edition, and I'm going to press with a full retraction right now. It was Hartwell who did it. He wrote the thing and stood over us until it was out and on the streets. Then he went to his office and shut himself in. He seemed to be desperately worried—"

"Never mind that," snapped

Cranborne, "put him on. I want to talk to him."

"Sorry, sir, but I was coming to that. Five minutes ago Mr. Hartwell jumped out the window, and it's nineteen floors down."

"Holy Moses!" exploded Cranborne.

There was not the slightest doubt that a malign power was working toward his ruin, but Cranborne could not fathom the motive or the means. He had always been a square shooter and had no known enemies. His organization had proved itself proof against bribery or cunning during the war. Yet the affair of the superplastic process showed that secrets did leak, and the attacks on him by Skelly and his friend Hartwell indicated someone was out to take his life and besmirch his reputation. It called for drastic action, but first he must have information.

Two days later Gibson rushed off to Washington with the completed plans for the new televisor. He carried with him all the other inventions formerly held in the vault, without regard to whether the market was ripe for their reception. Cranborne was insistent on making the test.

His worst fears were confirmed. Not only had all the vault inventions been patented to others, some as far back as six months before, but the new televisor had been submitted as well—the day before. A few of the patents had been issued to Joaquin Jones, the remainder to a miscellany of companies, some of which McKeller's investigation found to be controlled or owned by the same Jones.

"I don't get it," frowned Cranborne. "Jones couldn't pour sand out of a boot with the directions written on the sole."

Yet Jones seemed to have them, and with their files destroyed there appeared little they could do about it. Cranborne was deeply troubled. He was convinced by the snatching of the televisor plans from under his own eyes that he had to deal with some form of spy ray, and that therefore it was useless to struggle in the conventional manner. Cranborne Labs faced a crisis. The stuff held in the vault was its sole asset, and now that was stolen. Its future income depended on a stream of continuing inventions, but it looked as if those could now be lifted at their source. Worst of all, Cranborne owed a note of a hundred thousand dollars at the First National Bank. The superplastic patents would have cleaned that up and to spare. That deal was out the window.

"This is what comes of being grubbing scientists," muttered Cranborne moodily. "We haven't been keeping track of what goes on in the world. I am going to look up Mr. Joaquin Jones."

It was an amazing and baffling trail. Cranborne took it up where last he had seen it—at the architect's office where Jones had been a draftsman.

"Jones?" said the architect, with a wry smile. "You bet I remember him. A good-looking brute, but dopey as they come. He falls on his feet though. After I let him out he married a beautiful girl with scads of money. I understand he's a big shot now. Ask anyone in the financial district or city hall."

Cranborne did, with startling results.

"He *is* a big shot," confirmed Leffingwell, a broker Cranborne knew, "but don't ask me how he got that way. He's a stuffed shirt if I ever saw one. However, I'm told he is political boss of this city now and hands out judgeships and memberships in Congress to the right people—meaning people who will play his game. There's no way to get at him legally. He's czar. He has feathered his nest, too. Nobody knows how many big holding companies he owns outright, or what he controls through them. It is pretty hush-hush business. The only big job he holds in the open is at the First National. He took over the presidency of that last week."

"It looks as if he was out to get me," said Cranborne gloomily.

"If he is, you're all washed up," was the cheering answer.

There was nothing else to do but dissolve Cranborne Labs, for on his return to the office Cranborne found a letter from the bank saying the note coming due would not be extended. It was cold and curt. It was signed by Joaquin Jones.

"This persecution is directed at me," Cranborne told the associates when they assembled. "All of us have been hit in the pocketbook, but since I am singled out for murderous attack as well it would be better for the rest of you to cut loose and fend for yourselves. I'm sorry."

There was a hubbub of protests and offers to pass the hat and meet the note among them. But Cranborne pointed out the futility of it.

"I'm sticking," announced Gibson, when the rest filed out. "What do we do next?"

"I am going to call on Mr. Joaquin Jones."

Jones was in his luxurious office suite in the penthouse atop the bank building. His waiting room was crammed with important men—industrial tycoons, renowned bankers, and political leg men. Cranborne knew them from their published pictures. He expected to be kept waiting hours, if seen at all.

The contrary happened. His name had hardly gone in when the inner door opened and Jones stepped out, beaming an oily, fatuous smile.

"So glad you came," he said heartily, "I knew you were on the way. Right this way, please."

Jiggs, president of Consolidated Traction and a daring Wall Street operator shifted himself testily in his chair and glared at Cranborne. Jiggs evidently did not like being passed over. But big, handsome, stupid-looking Jones either did not notice, or care, for he ushered his newest caller into his private office. He then waved affably to an empty chair. Cranborne did not sit down. Jones shrugged and smiled good-naturedly.

"You know, of course, that we intend to foreclose and smash your outfit," he said calmly, "and that there is no use whatever in protesting."

It was not a question, but a statement.

"You seem to know everything," said Cranborne dryly.

"A man in my position has to know," answered Jones. His face was entirely devoid of expression except for a meaningless half smile. He rattled off the words in a wooden, parrotlike manner, as if he had learned them by rote and was merely getting them out of his system. "I also know that your purpose in coming here was to size me up and find out if you could why you have been attacked."

"That is correct."

"Well," he said, with a curious self-deprecatory whimper, "*I* have nothing against you whatever."

"You have stolen the accumulated work of fifteen good men. You have wrecked a fine-going organization—"

"Oh, no. Please! Not I. I am only the beneficiary. It was another who did that. A man whom you made the disastrous error of underestimating. A man whom you grievously wronged. It was not the money he cared about. He wanted to teach you your place."

Cranborne could only stare into that bland, witless face and marvel. There was neither rage nor cold arrogance. There was not even the explanatory glitter of the madman's eye. There was nothing but a zombielike puppet mouthing words.

"Now that your back is broken and your fangs drawn," Jones went on in the same deadpan way, "he wants you to know who did it and why. He is finished with you now and inaccessible to you, but he directed me to summon you here and remind you of the last words he spoke to you, so that you can think them over for the rest of your blighted life. The man you recklessly flouted was none other than Neville Bronson, the greatest man of all times!"

"Bronson!"

Cranborne had completely forgotten the fellow. Now the incident came back to him. He recalled with great distinctness the ugly, dwarfish little fellow, high-strung and nervous to a fault, dancing about his office and pounding on his desk. "Mark my words," he had yelled in frenzy in that final interview, "I am going to be master of the world, and when I am you'll bitterly regret this day. Who helps me I will befriend, who hinders me I will crush." That was all there was to it. A disgruntled former associate with a childish grudge. A man of admitted scientific capacity, not to say genius, but one who was hopelessly vain, arrogant, and overambitious.

"Oh, Bronson," repeated Cranborne, after a second. "Yes, I know the little runt. And I know his limitations. Very well, he has declared war. War it will be. And if you, Jones, get hurt in the course of it, so much the worse for you. Good day."

Joaquin Jones chuckled. It was a normal, hearty chuckle, without a single overtone of malice in it.

"Bronson will enjoy that, I am sure," was all he said.

Cranborne had a hard time getting to sleep that night. In fact, he did not sleep at all. He was thinking about that curious man, Neville Bronson. The first impulse was to think of him as a madman, but he was not mad. Neurotic, yes, but not insane. His trouble was that he was undersized, ugly and deformed. One leg was shrunken and there was the hint of a back hump, and his long pendulous nose gave him a gnomish appearance that drew giggles or aversion from women. To offset this—or perhaps to heighten the effect of it—was a keen mind that leaped all technical obstacles at a rush. The resultant was a bitter psychic conflict, the sense of intellectual superiority on the one hand and physical inadequacy on the other. It manifested itself in a quarrelsome and arrogant disposition that immediately estranged any rash enough to try and work alongside him. It was his obnoxious personality that was the real reason for his leaving the Labs. The other associates had voted him out.

Cranborne had difficulty in recalling the exact pretext employed in dismissal. Bronson had come into his office full of fire and unquenchable energy to announce gloatingly that he had hit upon an idea that would make him master of the world. He refused to divulge any detail of it other than to say the preliminary work would require vast sums of money. He offered to proceed with it and cut in the Lab associates as assistants, provided they furnished all the money, asked no questions, and gave him full control.

"Too vague," Cranborne told him, "and we have more pressing things to do. We are at war. We'll talk about this later."

"We'll talk about it now!" shouted Bronson venomously.

That was how Cranborne recalled Bronson—an overcompensated inferiority complex with a grievance against the world, highlighted by pointed hatred for certain individuals. Such a man might easily become a menace to civilization, as witness the career of the creature Hitler.

Cranborne pommeled his brains for fragments about the mysterious invention that was to give the mastery, but nothing came up. There was only the recollection that after Bronson's departure they found some crumpled papers in the bottom of his locker. The recollection of those snapped Cranborne wide awake.

He rolled out of bed and turned on the light. It was near to dawn, but after a little he found what he was looking for. It was among the dusty notebooks in the bottom of the closet—books in which he had jotted down the salient aspects of all the duds and false starts he had ever worked on. He found the sheaf of folded sheets, still marked with the creases where they had been crumpled. Cranborne spread them out on the bed and looked them over.

They were on cross-section paper, and such data there was, was in the form of tremulous curves. Each of the curves was different, but their general trend was the same. Faber had examined them once and rendered the opinion that they were tracings of electrical currents in the human nervous system, such as are made in electrocardiograms and cephalàgrams. Some bore cryptic notations such as, "oc," "aud," "cal" and there was a group marked "mot-36K" and other numerical variations.

Cranborne turned them over in his hands and scrutinized the backs carefully. He found one sheet on which there had been some pencil scribblings, now erased. In a moment he had rigged his ultraviolet lamp and was studying the paper under a glass. The words that had been erased all began with the root "psycho," as if Bronson had been groping for a tentative title for his embryo invention. The clearest one remaining was the word "psychodet."

"Ah," thought Cranborne, and gazed at the word. "Psycho," having to do with human mental processes; "det" meaning, apparently, detection. So that was the secret of Bronson's spy ray. But how—

Then he was on the phone, calling Faber first, Gibson next. Their sleepy voices quickly snapped to alert. Yes, they said, they were ready for anything. Neither had made other connection yet, and Gibson had a neat little laboratory in the outbuildings of his country cottage. Cranborne was welcome to use that. After which it was only a question of getting dressed, finding a taxicab, and picking up Faber on the way.

Having said only enough to arouse their interest, Cranborne thought hard about bees and flowers and the price of wheat. If he was in a fight with a mind reader, he would have to guard his mind. It was not until they had washed down Gibson's impromptu breakfast of ham and eggs with good strong coffee that he let down the veil.

"You know about brain currents, fellows," he said, "and that any kind of oscillating electric current sets up magnetic waves. My hunch is that Bronson has worked out a way to tune in on what we feel and think. Can you devise an umbrella of static to jam our thoughts in case he is listening in?"

"I guess so," grinned Gibson. "Where are you going to do your thinking? In my lab?"

Within the hour they had constructed a sort of electric chair, in which they sat in turns while their characteristic brain waves were recorded. Then Gibson threw together an oscillator-amplifier combination and started it humming. scrambling the field about them hopelessly.

"Let him tune in on that," said Gibson, cheerfully, after testing it. "It covers all of us. What he'll get is an earful of noise."

Then Cranborne unloaded.

"We are up against a man with hatred in his heart," he said, "and out to get us. He is clever. He knows all about neural currents, and he was a whiz at applied radionics. He did all his dirty work very cagily. He first stripped us of our secrets and put them beyond our reach, so slyly that we were unaware. As long as he worked his spy ray discreetly we were in the dark. But his egotism got the best of him. He wanted us to know about *him,* and his fiendish cleverness. So he went further. Instead of being content with receiving our sensations, he started *to send out motor impulses.* We might also have been unaware of that, but we happen to be strong-minded folk. While he was trying to make Skelly shoot me, Skelly's tendency was to let his arm hang and greet me in the normal way. The result was conflict. Skelly was caught off guard to the extent that Bronson succeeded to a point, but the shot missed me just the same.

"That gives us a pretty good clue as to the nature of his machine. He tunes in on our neural fields just as people do with ordinary radio. But with this difference. He not only sees and listens, but he can send. That is what we have to work out."

"That is all very well," remarked Faber, "but how did he do either? We worked a long time on a spy ray and couldn't get it to work. It wasn't selective enough. We could pick up brain waves—millions of them, piled one on another—but we could never unsnarl them or identify them."

"Because we never went deep enough into analysis. The human brain is constantly busy with a myriad of activities—automatic and otherwise—all utilizing current. Muscle tonus keeps up a steady roar, no matter what else is happening. A man can be eating and conversing at the same time. Note what is brought into play—olfactory and taste sensations, the sight and sound of his friend, and the intellectual interpretation of what he says. Demands are made on the memory files, and signals are sent to the blood vessels and gastric glands. It's a forty-ring circus. When we tune in on that we have a jumble, as when you hang out a window over Times Square and hear the roar of the crowd. It tells you nothing about any individual."

"So?"

"So we'll take the hint left us by Bronson himself. These sketch curves. 'Oc,' I take it, signifies the optic nerve, 'aud' the auditory, and so on. We'll leave the motor impulses out for the time being, as an unnecessary complication. If we can tune in on him as he has done on us, we can learn that with minimum effort. All right. Now suppose we rebuild our original spy-ray set—the one that flopped—but with the addition of a bank of resonators tuned to the *kind* of curve we want to select. We thereby filter out all the body impulses but chosen incoming main sensory nerves—sight, hearing and feeling."

"Why feeling?"

"We might want to test texture," said Cranborne. "Sight is often deceptive."

They went to work immediately. The first job was left to Faber—the identification of the desired curves, each of which had its own characteristic form. He did this by means of a brain probe they threw together after hours of discussion. It was an ingenious needlelike gadget which sent out impulses for variable distances from millimeters to inches. The impulses returned boomerang fashion, but grouped according to the interference they had encountered. They could thus sound the skull and locate nerve trunks. The identification of particular ones was a matter of trial and error. Cranborne acted as guinea pig. Oscillographs told the story.

Faber touched the probe to Cranborne's forehead and pressed the foot switch. A curve showed on the paper. Gibson jabbed a needle into the subject's arm. "Yow," said Cranborne, flinching. But the tracing did not vary.

"Not sensory," cracked Gibson, lighting a firecracker behind Cranborne's back. When it popped, Cranborne jumped again, but still not the tracing.

"Not auditory," said Gibson, and flicked an unseen switch. A ruby lamp on the instrument board came on, then went out. The curve rose sharply, wobbled, then fell back to the norm.

"One down," said Faber, joyfully, and took down the tracing and labeled it.

By the end of the week they had all the data they needed for the first step. There were three complete sets of curves, alike, but different.

"Like fingerprints," observed Faber. "When we acquire a big enough library of these we can dope out a classification system. In the meantime we will have to work hit or miss."

"Good enough for a starter," grunted Cranborne. "Let's get busy building our machine."

The finished contraption looked like a surrealistic conception of a pipe organ minus pipes. There was a triple keyboard consisting solely of stops, not keys, and there were pedals. Where the dummy pipes should have stood was a bank of indicators and tuning dials. It was an instrument both complex and simple. The operator sat on a stool before it, wearing a set of headphones without ear pieces. It merely held induction coils close to the skull bone.

"Here goes," said Cranborne, and sat down to make the first try. He twiddled with the starting switch and waited for the machine to warm up. "Too bad the directories don't list people by their mental wave lengths. Finding one certain man among ten millions may take time."

That could come later. The main thing was to find out whether the psychodet spy ray would work at all. He pulled the stop marked "optical" and grasped the tuning dial. He knew Faber's wave length, so he tried that first, and was treated to a Faber's-eye view of himself—the nape of his neck, with the machine as background, for Faber was standing directly behind him. So far, so good. He twisted the dial again, blinking as a kaleidoscope of passing mixed and amorphous color blinded him. Then he remembered and eased off on the pedal, cutting down the volume. Suddenly he stopped and frowned. All he saw then was a dull glowing red. He put on more power, but the effect was only to intensify the red. No detail would come out. He smiled.

"I've got somebody distinctly," he said. "I think the guy's asleep." He pulled the auditory stop and his ears were promptly assaulted by a tremendous roar. "A shirker snoozing in the corner of a boiler shop is my guess," he ventured, "or maybe a blind man."

He was at once disabused. The flat red disappeared. The unknown subject's eyes had opened. Cranborne was looking at three men sitting in a row a few feet in front of him. They were staring down at his knees, or where his knees should be. Then the eyes he had preempted turned downward in the same direction. He saw the lower half of a brief skirt and two plump silk-stocking knees protruding from under it. Two well-modeled hands promptly came into the field of vision and gave a futile tug at the inadequate skirt hem.

"I'm a girl!" said Cranborne. "Not bad-looking, either. I'm in a subway, going somewhere."

"String along," howled his helpers. "See what happens."

The girl got out when the subway stopped and climbed some stairs. She turned down a side street, Cranborne seeing what she saw as she went. It gave him an eerie feeling to be drifting along that way without sensation other than sight, for he had long since cut the sound wave to save his ears. He missed the swish of wind on the cheeks and the gentle jar when her heels hit the pavement. It was spring, too, and he wondered how she felt. He yanked the "sensory" full-skin combination.

"Crickets!" he yelped, and promptly shoved the stop back in.

"Now what?" came the eager questions.

"Tight shoes," Cranborne explained.

Then his subject entered an office building, and a few minutes later was at a typewriter knocking out a letter from notes. Cranborne followed the text of it shamelessly. Apparently her boss was a bookmaker or in some other occupation on the fringe of legality, for the letter was to the district attorney about some matter recently discussed. It was not the kind of letter whose publication would have done either one of them good. Cranborne had seen all he needed for the time being. He shut off the machine and whirled around.

"It works," he said. "And it's the most—or next to the most—hellish device man has invented so far. No wonder Bronson said he could master the world. We've all heard the expression 'knowledge is power' often enough to come to think it a cliché. Well, it's awfully sound."

There was no need to elaborate the idea. One had only to imagine the applications. Blackmail alone is a potent weapon, but a spy-ray's fullest uses transcend that by far. The spy has but to listen in on directors' meetings to find out the condition and intentions of a given company. He can then buy or sell stocks accordingly. Or land, or raw material. The inside story of what went on in a smoke-filled hotel room during a national convention would be of value to the politicians on the other side—or of another faction of the same party. The possessor of it could thereby curry favor. Money and political power is a hard combination. But those were the larger uses of the spy ray. The more intimate, personal ones would be of still greater value to the egotistical, and also to the—shall we say?—prurient.

"The problem now is to find Bronson and smash him," Cranborne concluded.

The how of it was not easy to find. Nobody had the same wave length, and no waves were registered. It was hard even to identify the subjects they picked up at random. By working night and day in shifts they managed to reach an immense list of known persons by their tuning numbers. But neither Jones nor Bronson was on the list. They knew where Jones hung out, but not Bronson. Outside investigation could not turn him up. He had walked out of the world's ken the day he left Cranborne's Labs in his magnificent huff.

"We'll have to go deeper than sensation. We have to dig into the thought processes and the memory field."

That was what they decided. It led to more brain probing, a necessity that was embarrassing to them all. But they framed a very curious oath of mutual respect, confidence, and advance forgiveness for any jarring thought, and they solemnly swore to it. After that they searched for each other's seats of memory. Then they modified the psychodet by adding other tubes and stops, and resumed their hunting.

One fine day when Cranborne and Faber were off duty and sunbathing in the yard, a series of wild yells brought them upstanding. Gibson had hit on something. They ran in to see what.

"I've got Jones. Just blundered onto him," he said, greatly excited. The two companions grabbed auxiliary headsets and listened in. It was disappointing. There was nothing to listen to. Such thoughts that came through were listless, incoherent and wandering. The man was fretting because he had to spend so much time at his desk. Off and on his mind would wander backward with relish to a steak eaten the night before, or forward in anticipation of tonight's dinner. There were warming flashes, too, as he occasionally thought of his adorable wife. The man's mind was not a blank, but its contents were distinctly not worth while. His conscious thoughts were those of any healthy moron—on the fleshy side. His perceptible memory was virtually blank. They had no way of exciting it, and it seemed he had no desire to do it of himself.

"As I suspected," said Cranborne grimly. "He's just a stooge, waiting for his master's voice. Now that we've got him, hang on. Sooner or later we'll learn something."

The break came sooner than they expected. Ten minutes later there was a sharp increase in the intensity of thought, and it came through with great clarity. To sharpen their perception they had already shut off all the outside sensory channels. The thought they heard now was worded this way:

"There is a young man named Heard on his way to see me. He will arrive in ten minutes. He wants my intercession with the law to keep him out of jail. He has been directed to come and ask for it, but I shall advise him to give himself up and plead guilty, promising to see that he receives a pardon. The crime is murder—"

"Quick," yelled Cranborne, for Gibson was still in the saddle, "pull the visual stop. I want to see."

The field of vision was blurred at first and Cranborne had trouble untangling it. It was a double exposure. Superposed on what Jones was looking at was what someone else was seeing. The first image was a desktop, the second the operating panel of another psychodet, resembling in the main the one they were operating. Cranborne whipped a pad of paper off the table and began sketching furiously. He concentrated on what he saw, leaving it to the others to do the listening. Then, suddenly, the vision clarified to a single image, and the thought stream dropped back to its normal level. Cranborne snatched off his headgear and reached for a slide rule.

"We've got him!" he exulted. "Bronson himself! His own conceit has betrayed him. Look!"

They crowded around and examined his sketch. The other psychodet, being further developed than their own crude attempt, was simpler in its corresponding features, but it had added buttons and panels for sending various motor impulses, including those of thought. Their workings were not apparent, but they were plainly labeled. What had excited Cranborne was the table of code numerals. Bronson had hung them before him for convenience. It was a list of his principal stooges and victims. Joaquin Jones' number was there, as well as Cranborne's own and Gibson's. But the priceless detail of the sketch was a framed item let into the operating panel, an outstanding example of the man's colossal ego. It was a wiggly curve done in gold ink on a black mat. Under it was its tuning symbol, and the legend "Formula for Greatness." The curve was a thought curve, having the characteristics of abstract reasoning.

"How did you come to think of it?" clamored the others, admiringly.

"The thoughts he was impressing on Jones were coming in on Jones' wave, and they told us nothing about the whereabouts of Bronson on the band. But since we know these are two-way waves, it occurred to me that if we switched on the vision we could see past Jones and into the sender. It probably went through a scrambler at the other end, wrong side to, but it bounced back again as I hoped. Also our waves went through Jones both ways, but since he can perceive only what Bronson wants him to perceive, he was unconscious of it. It was lucky for us Bronson has such an inflated idea of himself. Otherwise we would only have had the picture of his machine."

The stated machine settings differed, but Cranborne had his Rosetta Stone. There were his and Gibson's and Jones' tuning numbers in both codes. It was a relatively easy matter to reconstruct the dialing system of the Bronson set and translate his directory into terms they could use. The most magnificent gift of all was that of Bronson's own call. Now they had him.

"What are we going to do about Betty Nevers?" asked Faber, abruptly, once Cranborne had satisfied himself with a brief spell of gloating.

"What about her?" snapped Cranborne. He had not given the girl a thought since the day he sent her away.

"Were you concentrating on that sketch so hard you didn't hear? She has been brutally killed. Heard did it. That is why he came to see Jones."

"No," said Cranborne, sitting up and looking stern. "Start at the beginning."

"We infer that Bronson also held a grudge against both Heard and the girl. At least he prompted Heard to kill her, just as he tried to make Skelly do in your case. Heard beat her to death with a hammer. It seems they were lovers. Now Heard is going to the chair. What do you make of it?"

"I don't know who this Heard is," said Cranborne slowly, "but I can throw some light on the rest of it. Bronson tried hard to date Miss Nevers while he was with us. She laughed at him, and he probably hates her for it. Pique and jealousy, leavened with unlimited quantities of sadism. We've got to stop that beast and quickly. Never mind Jones from now on. When we pull his prop from under him his phony empire will collapse like a house of cards. Tune in on Bronson now and let's see what his filthy mind holds."

Delving into the black soul of Neville Bronson, proved to be a far from pleasant chore. There were times when the operator on watch gave up and quit out of sheer disgust. But they were convinced the man was sane, in a cold, calculating, inhuman way. Only a handful of his acts had been committed from pure spite. Most of them were to gain power. His craving for power was unlimited, and he knew he had the means to achieve it. He did not care a whit who got the nominal credit, so long as it was he who had the thing done his way. His looting of the Cranborne Labs was only incidentally to seek revenge, and his attempt to slay Cranborne was simply out of fear of the one intellect he regarded as possibly superior to his own.

There was an amusing sequel to that. Like himself, who lived hidden away they knew not where, Cranborne had disappeared from sight when he went to the Gibson place. Bronson's angry curses, when he would tune in only to pick up the howl of the umbrella of static, often brought stern smiles to the faces of the watchers.

It was one thing to be convinced of the man's villainy and another to undo it. The three inventors knew the histories of a dozen major crimes and countless instances of badly concealed blackmail, but there was nothing they could do. By then the machinery of the law was under Bronson's thumb, via his proxy Jones. If the lie detector is not received in honest courts, how could they expect the evidence of their psychodet to be accepted? No prosecutor would listen to it.

"We'll have to take the law into our own hands," said Cranborne, savagely. "I would like to see him convicted in the open, but with that machine in his hands he is invulnerable. All we know about his hideout is how it looks inside, and that he lives like a king with a single Japanese house boy to serve him. We do not even know what state he is in."

The next step was obvious. They fished the secret from his unaware brain of how to send impulses. It was a much more complicated device than a mere receiver, and required an abundance of power. It took three months to build and test on one another. Then they were sure it would work.

"Now what?" was the question at the next council of war.

"Make him go berserk and smash his machine," suggested Faber.

"Yeah," agreed Gibson, "and then force him to go to the nearest police station and give himself up."

"With the machine smashed the police would never believe him," said Cranborne, sitting down on the stool and tuning in. The machine was still set to receive Bronson's perceptions, and as it warmed up Cranborne's face grew tense. The hour was near to midnight and the others were watching closely.

"Good Lord," he gasped, and his face went white. Then it set in granite lines and his eyes hardened. Gibson and Faber did not say a word. They watched.

Suddenly they saw Cranborne's hand go out and push in the sending switch. What thoughts he was impressing on the waves they could not know, but Cranborne's face was iron and his eyes intent. Then he jammed the pedal down hard and locked it, and jumped up from the seat.

"Outside, all of you! I don't know what will happen next."

His urgency was contagious, and they hurried after him out into the starlight of the yard, and did not stop until Cranborne said they might—a hundred feet away.

"What did you do?" whispered Gibson, awed.

"I made him shove in his full sensory reception and step up his set to full power, then lock it. When he had done that, I paralyzed him where he sat."

Cranborne mopped his brow and glanced apprehensively toward the shed.

"Yes, go on. What was he doing?"

"Eavesdropping on one of his victims, as usual. But with a difference. Tonight the cold, merciless, curious scientist is topmost in him. He is out to learn the unlearnable—something about bodily sensations never before studied. He was going to do it on low power, with due precautions. Well, he'll learn something, all right. I'll guarantee that."

"Quit being so cryptic," growled Gibson. "What are you driving at?"

"Neville Bronson," said Cranborne slowly, "is tuned in on State Prison. There is an execution there tonight. Heard goes to the chair any minute now—"

A blare of violet light turned night into day for a split second, and circuit-breakers screamed. There was the smell of burning insulation. The psychodet was collapsing in a flaming shed. Nobody thought of calling the fire department. They did not want it. Their spy ray had served its purpose.

"Fair enough," shrugged Gibson. The three turned their backs on the blaze, and walked away toward the house.

THE END.

Far Centaurus

by A. E. van Vogt

***This** was the Great Adventure—across the span of light-years of space to Centaurus, across the span of five centuries the trip would take—to be first of men to reach another star!*

Illustrated by Orban

I WAKENED with a start, and thought: How was Renfrew taking it?

I must have moved physically, for blackness edged with pain closed over me. How long I lay in that agonized faint, I have no means of knowing. My next awareness was of the thrusting of the engines that drove the spaceship.

Slowly this time, consciousness returned. I lay very quiet, feeling the weight of my years of sleep, determined to follow the routine prescribed so long ago by Pelham.

I didn't want to faint again.

I lay there, and I thought: It was silly to have worried about Jim Renfrew. He wasn't due to come out of his state of suspended animation for another fifty years.

I began to watch the illuminated face of the clock in the ceiling. It had registered 23:12; now it was 23:22. The ten minutes Pelham had suggested for a time lapse between passivity and initial action was up.

Slowly, I pushed my hand toward the edge of the bed. *Click!* My fingers pressed the button that was there. There was a faint hum. The automatic massager began to fumble gently over my naked form.

First, it rubbed my arms; then it moved to my legs, and so on over my body. As it progressed, I could feel the fine slick of oil that oozed from it working into my dry skin.

A dozen times I could have screamed from the pain of life returning. But in an hour I was able to sit up and turn on the lights.

The small, sparsely furnished, familiar room couldn't hold my attention for more than an instant. I stood up.

The movement must have been too abrupt. I swayed, caught on to the metal column of the bed, and retched discolored stomach juices.

The nausea passed. But it required an effort of will for me to walk to the door, open it, and head along the narrow corridor that led to the control room.

I wasn't supposed to so much as pause there, but a spasm of absolutely dreadful fascination seized me; and I couldn't help it. I leaned over the control chair, and glanced at the chronometer.

It said: 53 years, 7 months, 2 weeks, 0 days, 0 hours and 27 minutes.

Fifty-three years! A little blindly, almost blankly: Back on Earth, the people we had known, the young men we'd gone to college with, that girl who had kissed me at the party given us the night we left—they were all dead. Or dying of old age.

I remembered the girl very vividly. She was pretty, vivacious, a complete stranger. She had laughed as she offered her red lips, and she had said "A kiss for the ugly one, too."

She'd be a grandmother now, or in her grave.

Tears came to my eyes. I brushed them away, and began to heat the can of concentrated liquid that was to be my first food. Slowly, my mind calmed.

Fifty-three years and seven and one half months, I thought drably. Nearly four years over my allotted time. I'd have to do some figuring before I took another dose of Eternity drug. Twenty grains had been calculated to preserve my flesh and my life for exactly fifty years.

The stuff was evidently more potent than Pelham had been able to estimate from his short period advance tests.

I sat tense, narrow-eyed, thinking about that. Abrupt consciousness came of what I was doing.

Laughter spat from lips. The sound split the silence like a series of pistol shots, startled me.

But it also relieved me. Was I sitting here actually being critical? A miss of only four years was bull's-eye across that span of years.

Why, I was alive and still young. Time and space had been conquered. The universe belonged to man.

I ate my "soup," sipping each spoonful deliberately. I made the bowl last every second of thirty minutes. Then, greatly refreshed, I made my way back to the control room.

This time I paused for a long look through the plates. It took only a few moments to locate Sol, a very brightly glowing star in the approximate center of the rear-view plate.

Alpha Centauri required longer to locate. But it shone finally, a glow point in a light sprinkled darkness.

I wasted no time trying to estimate their distances. They *looked* right. In fifty-four years we had covered approximately one tenth of the four and one third light years to the famous nearest star system.

Satisfied, I threaded my way back to the living quarters. Take them in a row, I thought. Pelham first.

As I opened the air-tight door of Pelham's room, a sickening odor of decayed flesh tingled in my nostrils. With a gasp I slammed the door, stood there in the narrow hallway, shuddering.

After a minute, there was still nothing but the reality.

Pelham was dead.

I cannot clearly remember what I did then. I ran; I know that. I flung open Renfrew's door, then Blake's. The clean, sweet smell of their rooms, the sight of their silent bodies on their beds brought back a measure of my sanity.

A great sadness came to me. Poor, brave Pelham. Inventor of the Eternity drug that had made the great plunge into interstellar space possible, he lay dead now from his own invention.

What was it he had said: "The chances are greatly against any of us dying. But there is what I am calling a death factor of about ten percent, a by-product of the first dose. If our bodies survive the initial shock, they will survive additional doses.

The death factor must be greater than ten percent. That extra four years the drug had kept me asleep—

Gloomily, I went to the storeroom, and procured my personal spacesuit and a tarpaulin. But even with their help, it was a horrible business. The drug had preserved the body to some extent, but pieces kept falling off as I lifted it.

At last, I carried the tarpaulin and its contents to the air lock, and shoved it into space.

I felt pressed now for time. These waking periods were to be brief affairs, in which what we called the "current" oxygen was to be used up, but the main reserves were not to be touched. Chemicals in each room slowly refreshed the "current" air over the years, readying it for the next to awaken.

In some curious defensive fashion, we had neglected to allow for an emergency like the death of one of our members; even as I climbed out of the spacesuit, I could feel the difference in the air I was breathing.

I went first to the radio. It had been calculated that half a light year was the limit of radio reception, and we were approaching that limit now.

Hurriedly, though carefully, I wrote my report out, then read it into a transcription record, and started sending. I set the record to repeat a hundred times.

In a little more than five months hence, headlines would be flaring on Earth.

I clamped my written report into the ship log book, and added a note for Renfrew at the bottom. It was a brief tribute to Pelham. My praise was heartfelt, but there was another reason behind my note. They had been pals, Renfrew, the engineering genius who built the ship, and Pelham, the great chemist-doctor, whose Eternity drug had made it possible for men to take this fantastic journey into vastness.

It seemed to me that Renfrew, waking up into the great silence of the hurtling ship, would need my tribute to his friend and colleague. It was little enough for me to do, who loved them both.

The note written, I hastily examined the glowing engines, made notations of several instrument readings, and then counted out fifty-five grains of Eternity drug. That was as close as I could get to the amount I felt would be required for one hundred and fifty years.

For a long moment before sleep came, I thought of Renfrew and the terrible shock that was coming to him on top of all the natural reactions to his situations, that would strike deep into his peculiar, sensitive nature—

I stirred uneasily at the picture.

The worry was still in my mind when darkness came.

Almost instantly, I opened my eyes. I lay thinking: The drug! It hadn't worked.

The draggy feel of my body warned me of the truth. I lay very still watching the clock overhead. This time it was easier to follow the routine except that, once more, I could not refrain from examining the chronometer as I passed through the galley.

It read: 201 years, 1 month, 3 weeks, 5 days, 7 hours, 8 minutes.

I slipped my bowl of that super soup, then went eagerly to the big log book.

It is utterly impossible for me to describe the thrill that coursed through me, as I saw the familiar handwriting of Blake, and then, as I turned back the pages, of Renfrew.

My excitement drained slowly, as I read what Renfrew had written. It was a report; nothing more: gravitometric readings, a careful calculation of the distance covered, a detailed report on the performance of the engines, and, finally, an estimate of our speed variations, based on the seven consistent factors.

It was a splendid mathematical job, a first-rate scientific analysis. But that was all there was. No mention of Pelham, not a word of comment on what I had written or on what had happened.

Renfrew had wakened; and, if his report was any criterion, he might as well have been a robot.

I knew better than that.

So—I saw as I began to read Blake's report—did Blake.

Bill:

TEAR THIS SHEET OUT WHEN YOU'VE READ IT!

Well, the worst has happened. We couldn't have asked fate to give us an unkindlier kick in the pants. I hate to think of Pelham being dead—what a man he was, what a friend—but we all knew the risk we were taking, he more than any of us. Space rest his great soul.

But Renfrew's case is now serious. After all, we were worried, wondering how he'd take his first awakening, let alone a bang between the eyes like Pelham's death. And I think that first anxiety was justified.

As you and I have always known, Renfrew was one of Earth's fair-haired boys. Just imagine any one human being born with his combination of looks, money and intelligence. His great fault was that he never let the future trouble him. With that dazzling personality of his, and the crew of worshiping women and yes-men around him, he didn't have much time for anything but the present.

Realities always struck him like a thunderbolt. He could leave those three ex-wives of his—and they weren't so ex, if you ask me—without grasping that it was forever.

That good-by party was enough to put anyone into a sort of mental haze when it came to realities. To wake up a hundred years later, and realize that those he loved had withered, died and been eaten by worms—we-e-ll!

(I put it baldly like that because the human mind always thinks of the worst angles, no matter how it censors speech.)

I personally counted on Pelham acting as a sort of psychological support to Renfrew; and we both know that Pelham recognized the extent of his influence over Renfrew. That influence must be replaced. Try to think of something, Bill, while you're charging around doing the routine work. We've got to live with that guy after we all wake up at the end of the five hundred years.

Tear out this sheet. What follows is routine. NED.

I burned the letter in the incinerator, examined the two sleeping bodies—how deathly quiet they lay!—and then returned to the control room.

In the plate, the sun was a very bright star, a jewel set in black velvet, a gorgeous, shining brilliant.

Alpha Centauri was brighter. It was a radiant light in that panoply of black and glitter. It was still impossible to make out the separate suns of Alpha A, B, C and Proxima, but their combined light brought a sense of awe and majesty.

Excitement blazed inside me; and consciousness came of the glory of this trip we were making, the first men to head for far Centaurus, the first men to dare aspire to the stars.

Even the thought of Earth failed to dim that surging tide of wonder; the thought that seven, possibly eight generations, had been born since our departure; the thought that the girl who had given me the sweet remembrance of her red lips, was now known to her descendants as their great-great-great-great grandmother—if she was remembered at all.

The immense time involved, the whole idea, was too meaningless for emotion.

I did my work, took my third dose of the drug, and went to bed. The sleep found me still without a plan about Renfrew.

When I woke up, alarm bells were ringing.

I lay still. There was nothing else to do. If I had moved, consciousness would have slid from me. Though it was mental torture even to think it, I realized that, no matter what the danger, the quickest way was to follow my routine to the second and in every detail.

Somehow I did it. The bells clanged and *brrred,* but I lay there until it was time to get up. The clamor was hideous, as I passed through the control room. But I *passed* through, and sat for half an hour sipping my soup.

The conviction came to me that if that sound continued much longer, Blake and Renfrew would surely waken from their sleep.

At last, I felt free to cope with the emergency. Breathing hard, I eased myself into the control chair, cut off the mind-wrecking alarms, and switched on the plates.

A fire glowed at me from the rear-view plate. It was a colossal *white* fire, longer than it was wide, and filling nearly a quarter of the whole sky. The hideous thought came to me that we must be within a few million miles of some monstrous sun that had recently roared into this part of space.

Frantically, I manipulated the distance estimators—and then for a moment stared in blank disbelief at the answers that clicked metallically onto the product plate.

Seven miles! *Only* seven miles! Curious is the human mind. A moment before, when I had thought of it as an abnormally shaped sun, it hadn't resembled anything but an incandescent mass. Abruptly, now, I saw that it had a solid outline, an unmistakable material shape.

Stunned, I leaped to my feet because—

It was a spaceship! An enormous, mile-long ship. Rather—I sank back into my seat, subdued by the catastrophe I was witnessing, and consciously adjusting my mind—the flaming hell of what had been a spaceship. Nothing that had been alive could possibly still be conscious in that horror of ravenous fire. The only possibility was that the crew had succeeded in launching lifeboats.

Like a madman, I searched the heavens for a light, a glint of metal that would show the presence of survivors.

There was nothing but the night and the stars and the hell of burning ship.

After a long time, I noticed that it was farther away, and seemed to be receding. Whatever drive forces had matched its velocity to ours must be yielding to the fury of the energies that were consuming the ship.

I began to take pictures, and I felt justified in turning on the oxygen reserves. As it withdrew into distance, the miniature nova that had been a torpedo-shaped space liner began to change color, to lose its white intensity. It became a red fire silhouetted against darkness. My last glimpse showed it as a long, dull glow that looked like nothing else than a cherry colored nebula seen edge on, like a blaze reflecting from the night beyond a far horizon.

I had already, in between observations, done everything else required of me; and now, I re-connected the alarm system and, very reluctantly, my mind seething with speculation, returned to bed.

As I lay waiting for my final dosage of the trip to take effect, I thought: the great star system of Alpha Centauri must have inhabited planets. If my calculations were correct, we were only one point six light years from the main Alpha group of suns, slightly nearer than that to red Proxima.

Here was proof that the universe had at least one other supremely intelligent race. Wonders beyond our wildest expectations were in store for us. Thrill on thrill of anticipation raced through me.

It was only at the last instant, as sleep was already grasping at my brain that the realization struck that I had completely forgotten about the problem of Renfrew.

I felt no alarm. Surely, even Renfrew would come alive in that great fashion of his when confronted by a complex alien civilization.

Our troubles were over.

Excitement must have bridged that final one hundred fifty years of time. Because, when I wakened, I thought:

"We're here! It's over, the long night, the incredible journey. We'll all be waking, seeing each other, as well as the civilization out there. Seeing, too, the great Centauri suns."

The strange thing, it struck me as I lay there exulting, was that the time seemed long. And yet . . . yet I had been awake only three times, and only once for the equivalent of a full day.

In the truest sense of meaning, I had seen Blake and Renfrew—and Pelham—no more than a day and a half ago. I had had only thirty-six hours of consciousness since a pair of soft lips had set themselves against mine, and clung in the sweetest kiss of my life.

Then why this feeling that milleniums had ticked by, second on slow second? Why this eerie, empty awareness of a journey through fathomless, unending night?

Was the human mind so easily fooled?

It seemed to me, finally, that the answer was that *I* had been alive for those five hundred years, all my cells and my organs had existed, and it was not even impossible that some part of my brain had been horrendously aware throughout the entire unthinkable period.

And there was, of course, the additional psychological fact that I knew now that five hundred years had gone by, and that—

I saw with a mental start, that my ten minutes were up. Cautiously, I turned on the massager.

The gentle, padded hands had been working on me for about fifteen minutes when my door opened; the light clicked on, and there stood Blake.

The too-sharp movement of turning my head to look at him made me dizzy. I closed my eyes, and heard him walk across the room toward me.

After a minute, I was able to look at him again without seeing blurs. I saw then that he was carrying a bowl of the soup. He stood staring down at me with a strangely grim expression on his face.

At last, his long, thin countenance relaxed into a wan grin.

" 'Lo, Bill," he said. *"Ssshh!"* he hissed immediately. "Now, don't try to speak. I'm going to start feeding you this soup while you're still lying down. The sooner you're up, the better I'll like it."

He was grim again, as he finished almost as if it was an afterthought: "I've been up for two weeks."

He sat down on the edge of the bed, and ladled out a spoonful of "soup." There was silence, then, except for the rustling sound of the massager. Slowly, the strength flowed through my body; and with each passing second, I became more aware of the grimness of Blake.

"What about Renfrew?" I managed finally, hoarsely. "He awake?"

Blake hesitated, then nodded. His expression darkened with frown; he said simply:

"He's mad, Bill, stark, staring mad. I had to tie him up. I've got him now in his room. He's quieter now, but at the beginning he was a gibbering maniac."

"Are you crazy?" I whispered at last. "Renfrew was never so sensitive as that. Depressed and sick, yes; but the mere passage of time, abrupt awareness that all his friends are dead, couldn't make him insane."

Blake was shaking his head. "It isn't only that. Bill—"

He paused, then: "Bill, I want you to prepare your mind for the greatest shock it's ever had."

I stared up at him with an empty feeling inside me. "What do you mean?"

He went on, grimacing: "I know you'll be able to take it. So don't get scared. You and I, Bill, are just a couple of lugs. We're along because we went to U with Renfrew and Pelham. Basically, it wouldn't matter to insensitives like us whether we landed in 1,000,000 B. C. or A. D. We'd just look around and say: 'Fancy seeing you here, mug!' or 'Who was that pterodactyl I saw you with last night? That wasn't no pterodactyl; that was Unthahorsten's bulbuous brained wife."

"For Mars' sake," I whispered, "get to the point. What's up?"

Blake rose to his feet. "Bill, after I'd read your reports about, and seen the photographs of, that burning ship, I got an idea. The Alpha suns were pretty close two weeks ago, only about six months away at our average speed of five hundred miles a second. I thought to myself: 'I'll see if I can tune in some of their radio stations.'

"Well," he smiled wryly, "I got hundreds in a few minutes. They came in all over the seven wave dials, with bell-like clarity."

He paused; he stared down at me, and his smile was a sickly thing. "Bill," he groaned, "we're the prize fools in creation. When I told Renfrew the truth, he folded up like ice melting into water."

Once more, he paused; the silence was too much for my straining nerves.

"For Heaven's sake, man—" I began. And stopped. And lay there, very still. Just like that the lightning of understanding flashed on me. My blood seemed to thunder through my veins. At last, weekly, I said: "You mean—"

Blake nodded. "Yeah," he said. "That's the way it is. And they've already spotted us with their spy rays and energy screens. A ship's coming out to meet us.

"I only hope," he finished gloomily, "they can do something for Jim."

I was sitting in the control chair an hour later when I saw the glint in the darkness. There was a flash of bright silver, that exploded into size. The next instant, an enormous spaceship had matched our velocity less than a mile away.

Blake and I looked at each other. "Did they say," I said shakily, "that that ship left its hangar ten minutes ago?"

Blake nodded. "They can make the trip from Earth to Centauri in three hours," he said.

I hadn't heard that before. Something happened inside my brain. "What!" I shouted. "Why, it's taken us five hund—"

I stopped; I sat there. "Three hours!" I whispered. "How *could* we have forgotten human progress?"

In the silence that fell then, we watched a dark hole open in the clifflike wall that faced us. Into this cavern, I directed our ship.

The rear-view plate showed that the cave entrance was closing. Ahead of us lights flashed on, and focused on a door. As I eased our craft to the metal floor, a face flickered onto our radio plate.

"Cassellahat!" Blake whispered in my ear. "The only chap who's talked direct to me so far."

It was a distinguished, a scholarly looking head and face that peered at us. Cassellahat smiled, and said:

"You may leave your ship, and go through the door you see."

I had a sense of empty spaces around us, as we climbed gingerly out into the vast receptor chamber. Interplanetary spaceship hangars were like that, I reminded myself.

Only this one had an alien quality that—

"Nerves!" I thought sharply.

But I could see that Blake felt it, too. A silent duo, we filed through the doorway into a hallway, that opened into a very large, luxurious room.

It was such a room as a king or a movie actress on set might have walked into without blinking. It was all hung with gorgeous tapestries—that is, for a moment, I thought they were trapestries; then I saw they weren't. They were—I couldn't decide.

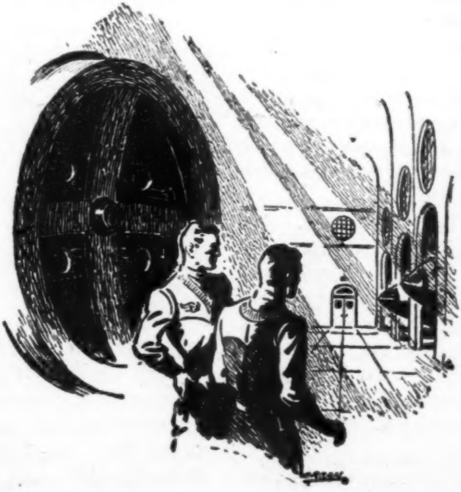
I had seen expensive furniture in some of the apartments Renfrew maintained. But these chesterfields, chairs and tables glittered at us, as if they were made of a matching design of differently colored fires. No, that was wrong; they didn't glitter at all. They—

Once more I couldn't decide.

I had no time for more detailed examination. For a man arrayed very much as we were, was rising from one of the chairs. I recognized Cassellahat.

He came forward, smiling. Then he slowed, his nose wrinkling. A moment later, he hastily shook our hands, then swiftly retreated to a chair ten feet away, and sat down rather primly.

It was an astoundingly ungracious performance. But I was glad that he had drawn back that way. Because, as he shook my hand so briefly, I had caught a faint whiff of perfume from him. It was a vaguely unpleasant odor; and, be-



sides—a man using perfume in quantities!

I shuddered. What kind of foppish nonsense had the human race gone in for?

He was motioning us to sit down. I did so, wondering: Was this our reception? The erstwhile radio operator began:

"About your friend, I must caution you. He is a schizoid type, and our psychologists will be able to effect a temporary recovery only for the moment. A permanent cure will require a longer period, and your fullest co-operation. Fall in readily with all Mr. Renfrew's plans, unless, of course, he takes a dangerous turn.

"But now"—he squirted us a smile—"permit me to welcome you to the four planets of Centauri. It is a great moment for me, personally. From early childhood, I have been trained for the sole purpose of being your mentor and guide; and naturally I am overjoyed that the time has come when my exhaustive studies of the middle period American language and customs can be put to the practical use for which they were intended."

He didn't look overjoyed. He was wrinkling his nose in that funny way I had already noticed, and there was a generally pained expression on his face. But it was his words that shocked me.

"What do you mean," I asked, "studies in American? Don't people speak the universal language any more?"

"Of course"—he smiled—"but the language has developed to a point where—I might as well be frank—you would have difficulty understanding such a simple word as 'yeih.' "

"Yeih?" Blake echoed.

"Meaning 'yes.' "

"Oh!"

We sat silent, Blake chewing his lower lip. It was Blake who finally said:

"What kind of places are the Centauri planets? You said something on the radio about the population centers having reverted to the city structure again."

"I shall be happy," said Cassellahat, "to show you as many of our great cities as you care to see. You are our guests, and several million credits have been placed to your separate accounts for you to use as you see fit."

"Gee!" said Blake.

"I must, however," Cassellahat went on, "give you a warning. It is important that you do not disillusion our peoples about yourselves. Therefore, you must never wander around the streets, or mingle with the crowds in any way. Always, your contact should be via newsreels, radio, or from the *inside* of a closed machine. If you have any plan to marry, you must now finally give up the idea."

"I don't get it!" Blake said wonderingly; and he spoke for us both.

Cassellahat finished firmly: "It is important that no one becomes aware that you have an offensive physical odor. It might damage your financial prospects considerably.

"And now"—he stood up—"for the time being, I shall leave you. I hope you don't mind if I wear a mask in future in your presence. I wish you well, gentlemen, and—"

He paused, glanced past us, said: "Ah, here is your friend."

I whirled, and I could see Blake twisting, staring—

"Hi, there, fellows," Renfrew said cheerfully from the door, then wryly: "Have we ever been a bunch of suckers?"

I felt choked. I raced up to him, caught his hand, hugged him. Blake was trying to do the same.

When we finally released Renfrew, and looked around, Cassellahat was gone.

Which was just as well. I had been wanting to punch him in the nose for his final remarks.

"Well, here goes!" Renfrew said.

He looked at Blake and me, grinned, rubbed his hands together gleefully, and added:

"For a week I've been watching, thinking up questions to ask this cluck and—"

He faced Cassellahat. "What," he began, "makes the speed of light constant?"

Cassellahat did not even blink. "Velocity equals the cube of the cube root of *gd*," he said, "*d* being the depth of the space time continuum, *g* the total toleration or gravity, as you would say, of all the matter in that continuum."

"How are planets formed?"

"A sun must balance itself in the space that it is in. It throws out matter as a sea vessel does anchors. That's a very rough description. I could give it to you in mathematical formula, but I'd have to write it down. After all, I'm not a scientist. These are merely facts that I've known from childhood, or so it seems."

"Just a minute," said Renfrew, puzzled. "A sun throws this matter out without any pressure other than its—desire—to balance itself?"

Cassellahat stared at him. "Of course not. The reason, the pressure involved, is very potent, I assure you. Without such a balance, the sun would fall out of this space. Only a few bachelor suns have learned how to maintain stability without planets."

"A few what?" echoed Renfrew.

I could see that he had been jarred into forgetting the questions he had been intending to ask one by swift one. Cassellahat's words cut across my thought; he said:

"A bachelor sun is a very old, cooled, class M star. The hottest one known has a temperature of one hundred ninety degrees F., the coldest forty-eight. Literally, a bachelor is a rogue, crochety with age. Its main feature is that it permits no matter, no planets, not even gases in its vicinity."

Renfrew sat silent, frowning, thoughtful. I seized the opportunity to carry on a train of idea.

"This business," I said, "of knowing all this stuff without being a scientist, interests me. For instance, back home every kid understood the atomic-rocket principle practically from the day he was born. Boys of eight and ten rode around in specially made toys, took them apart and put them together again. They *thought* rocket-atomic, and any new development in the field was just pie for them to absorb.

"Now, here's what I'd like to know: what is the parallel here to that particular angle?"

"The adeledicnander force," said Cassellahat. "I've already tried to explain it to Mr. Renfrew, but his mind seems to balk at some of the most simple aspects."

Renfrew roused himself, grimaced. "He's been trying to tell me that electrons think; and I won't swallow it."

Cassellahat shook his head. "Not think; they don't think. But they have a psychology."

"Electronic psychology!" I said.

"Simply adeledicnander," Cassellahat replied. "Any child—"

Renfrew groaned: "I know. Any child of six could tell me."

He turned to us. "That's why I lined up a lot of questions. I figured that if we got a good intermediate grounding, we might be able to slip into this adeledicnander stuff the way their kids do."

He faced Cassellahat. "Next question," he said. "What—"

Cassellahat had been looking at his watch. "I'm afraid, Mr. Renfrew," he interrupted, "that if you and I are going to be on the ferry to the Pelham planet, we'd better leave now. You can ask your questions on the way."

"What's all this?" I chimed in.

Renfrew explained: "He's taking me to the great engineering laboratories in the European mountains of Pelham. Want to come along?"

"Not me," I said.

Blake shrugged. "I don't fancy getting into one of those suits Cassellahat has provided for us, designed to keep our odor in, but not theirs out."

He finished: "Bill and I will stay here and play poker for some of that five million credits worth of dough we've got in the State bank.

Cassellahat turned at the door; there was a distinct frown on the flesh mask he wore. "You treat our government's gift very lightly."

"Yeih!" said Blake.

"So we stink," said Blake.

It was nine days since Cassellahat had taken Renfrew to the planet Pelham; and our only contact had been a radio telephone call from Renfrew on the third day, telling us not to worry.

Blake was standing at the window of our penthouse apartment in the city Newmerica; and I was on my back on a couch, in my mind a mixture of thoughts involving Renfrew's potential insanity and all the things I had heard and seen about the history of the past five hundred years.

I roused myself. "Quit it," I said. "We're faced with a change in the metabolism of the human body, probably due to the many different foods from remote stars that they eat. They must be able to smell better, too, because just being near us is agony to Cassellahat, whereas we only notice an unpleasantness from him. It's a case of three of us against billions of them. Frankly, I don't see an early victory over the problem, so let's just take it quietly."

There was no answer; so I returned to my reverie. My first radio message to Earth had been picked up; and so, when the interstellar drive was invented in 2320 A. D., less than one hundred forty years after our departure, it was realized what would eventually happen.

In our honor, the four habitable planets of the Alpha A and B suns were called Renfrew, Pelham, Blake and Endicott. Since 2320, the populations of the four planets had become so dense that a total of nineteen billion people now dwelt on their narrowing land spaces. This in spite of migrations to the planets of more distant stars.

The space liner I had seen burning in 2511 A. D. was the only ship ever lost on the Earth-Centauri lane. Traveling at full speed, its screens must have reacted against our spaceship. All the automatics would instantly have flashed on; and, as those defenses were not able at that time to stop a ship that had gone Minus Infinity, every recoil engine aboard had probably blown up.

Such a thing could not happen again. So enormous had been the progress in the adeledicnander field of power, that the greatest liners could stop dead in the full fury of mid-flight.

We had been told not to feel any sense of blame for that one disaster, as many of the most important advances in adeledicnander electronic psychology had been made as the result of theoretical analyses of that great catastrophe.

I grew aware that Blake had flung himself disgustedly into a nearby chair.

"Boy, oh, boy," he said, "this is going to be some life for us. We can all anticipate about fifty more years of being pariahs in a civilization where we can't even understand how the simplest machines work."

I stirred uneasily. I had had similar thoughts. But I said nothing. Blake went on:

"I must admit, after I first discovered the Centauri planets had been colonized, I had pictures of myself bowling over some dame, and marrying her."

Involuntarily, my mind leaped to the memory of a pair of lips lifting up to mine. I shook myself. I said:

"I wonder how Renfrew is taking all this. He—"

A familiar voice from the door cut off my words. "Renfrew," it said, "is taking things beautifully now that the first shock has yielded to resignation, and resignation to purpose."

We had turned to face him by the time he finished. Renfrew walked slowly toward us, grinning. Watching him, I felt uncertain as to just how to take his built-up sanity.

He was at his best. His dark, wavy hair was perfectly combed. His startlingly blue eyes made his whole face come alive. He was a natural physical wonder; and at his normal he had all the shine and swagger of an actor in a carefully tailored picture.

He wore that shine and swagger now. He said:

"I've bought a spaceship, fellows. Took all my money and part of yours, too. But I knew you'd back me up. Am I right?"

"Why, sure," Blake and I echoed.

Blake went on alone: "What's the idea."

"I get it," I chimed in. "We'll cruise all over the universe, live our life span exploring new worlds. Jim, you've got something there. Blake and I were just going to enter a suicide pact."

Renfrew was smiling. "We'll cruise for a while anyway."

Two days later, Cassellahat having offered no objection and no advice about Renfrew, we were in space.

It was a curious three months that followed. For a while I felt a sense of awe at the vastness of the cosmos. Silent planets swung into our viewing plates, and faded into remoteness behind us, leaving nostalgic memory of uninhabited, wind-lashed forests and plains, deserted, swollen seas and nameless suns.

The sight and the remembrance brought loneliness like an ache, and the knowledge, the slow knowledge, that this journeying was not lifting the weight of strangeness that had settled upon us ever since our arrival at Alpha Centauri.

There was nothing here for our souls to feed on, nothing that would satisfactorily fill one year of our life, let alone fifty. Nothing, nothing.

I watched the realization grow on Blake, and I waited for a sign from Renfrew that he felt it, too. The sign didn't come. That of itself worried me; then I grew aware of something else. Renfrew was watching us. Watching us with a hint in his manner of secret knowledge, a suggestion of secret purpose.

My alarm grew; and Renfrew's perpetual cheerfulness didn't help any. I was lying on my bunk at the end of the third month, thinking uneasily about the whole unsatisfactory situation, when my door opened, and Renfrew came in.

He carried a paralyzer gun and a rope. He pointed the gun at me, and said:

"Sorry, Bill. Cassellahat told me to take no chances, so just lie quiet while I tie you up."

"Blake!" I bellowed.

Renfrew shook his head gently. "No use," he said. "I was in his room first."

The gun was steady in his fingers, his blue eyes were steely. All I could do was tense my muscles against the ropes as he tied me, and trust to the fact that I was twice as strong, at least, as he was.

I thought in dismay: Surely I could prevent him from tying me too tightly.

He stepped back finally, said again. "Sorry, Bill." He added: "I hate to tell you this, but both of you went off the deep end mentally when we arrived at Centauri; and this is the cure prescribed by the psychologists whom Cassellahat consulted. You're supposed to get a shock as big as the one that knocked you for a loop.

The first time I'd paid no attention to his mention of Cassellahat's name. Now my mind flared with understanding.

Incredibly, Renfrew had been told that Blake and I were mad. All these months he had been held steady by a sense of responsibility toward us. It was a beautiful psychological scheme. The only thing was: *what* shock was going to be administered?

Renfrew's voice cut off my thought. He said:

"It won't be long now. We're already entering the field of the bachelor sun."

"Bachelor sun!" I yelled.

He made no reply. The instant the door closed behind him, I began to work on my bonds; all the time I was thinking:

What was it Cassellahat had said? Bachelor suns maintained themselves in this space by a precarious balancing.

In *this* space! The sweat poured down my face, as I pictured ourselves being precipitated into another plane of the space-time continuum—I could feel the ship falling when I finally worked my hands free of the rope.

I hadn't been tied long enough for the cords to interfere with my circulation. I headed for Blake's room. In two minutes we were on our way to the control cabin.

Renfrew didn't see us till we had him. Blake grabbed his gun; I hauled him out of the control chair with one mighty heave, and dumped him onto the floor.

He lay there, unresisting, grinning up at us. "Too late," he taunted. "We're approaching the first point of intolerance, and there's nothing you can do except prepare for the shock."

I scarcely heard him. I plumped myself into the chair, and glared into the viewing plates. Nothing showed. That stumped me for a second. Then I saw the recorder instruments. They were trembling furiously, registering a body of INFINITE size.

For one long moment I stared crazily at those incredible figures. Then plunged the decelerator far over. Before that pressure of full-driven adeledicnander, the machine grew rigid; I had a sudden fantastic picture of two irresistible forces in full collision. Gasping, I jerked the power out of gear.

We were still falling.

"An orbit," Blake was saying. "Get us into an orbit."

With shaking fingers, I pounded one out on the keyboard, basing my figures on a sun of Sol-ish size, gravity and mass.

The bachelor wouldn't let us have it.

I tried another orbit, and a third, and more—finally one that would have given us an orbit around mighty Antares itself. But the deadly reality remained. The ship plunged on, down and down.

And there was nothing visible on the plates, not a real shadow of substance. It seemed to me once that I could make out a vague blur of greater darkness against the black reaches of space. But the stars were few in every direction and it was impossible to be sure.

Finally, in despair, I whirled out of the seat, and knelt beside Renfrew, who was still making no effort to get up.

"Listen, Jim," I pleaded, "what did you do this for? What's going to happen?

He was smiling easily. "Think," he said, "of an old, crusty, human bachelor. He maintains a relationship with his fellows, but the association is as remote as that which exists between a bachelor sun and the stars in the galaxy of which it is a part."

He added: "Any second now we'll strike the first period of intolerance. It works in jumps like quantum, each period being four hundred ninety-eight years, seven months and eight days plus a few hours."

It sounded like gibberish. "But what's going to happen?" I urged. "For Heaven's sake, man!"

He gazed up at me blandly; and, looking up at him, I had the sudden, wondering realization that he was sane, the old, completely rational Jim Renfrew, made better somehow, stronger. He said quietly:

"Why, it'll just knock us out of its toleration area; and in doing so will put us back—"

JERK!

The lurch was immensely violent. With a bang, I struck the floor, skidded, and then a hand—Renfrew's—caught me. And it was all over.

I stood up, conscious that we were no longer falling. I looked at the instrument board. All the lights were dim, untroubled, the needles firmly at zero. I turned and stared at Renfrew, and at Blake, who was ruefully picking himself from the floor.

Renfrew said persuasively: "Let me at the control board, Bill. I want to set our course for Earth."

For a long minute, I gazed at him; and then, slowly, I stepped aside. I stood by as he set the controls and pulled the accelerator over. Renfrew looked up.

"We'll reach Earth in about eight hours," he said, "and it'll be about a year and a half after we left five hundred years ago."

Something began to tug at the roof of my cranium. It took several seconds before I realized that it was my brain jumping with the tremendous understanding that suddenly flowed in upon me.

The bachelor sun, I thought dazedly. In easing us out of its field of toleration, it had simply precipitated us into a period of time beyond its field. Renfrew had said . . . had said that it worked in jumps of . . . four hundred ninety-eight years and some seven months and—

But what about the ship? Wouldn't twenty-seventh century adeledicnander brought to the twenty-second century, before it was invented, change the course of history? I mumbled the question.

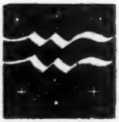
Renfrew shook his head. "Do *we* understand it? Do we even dare monkey with the raw power inside those engines? I'll say not. As for the ship, we'll keep it for our own private use."

"B-but—" I began.

He cut me off. "Look, Bill," he said, "here's the situation: that girl who kissed you—don't think I didn't see you falling like a ton of bricks—is going to be sitting beside you fifty years from now, when *your* voice from space reports to Earth that you had wakened on your first lap of the first trip to Centaurus."

That's exactly what happened.

THE END.



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A Matter of Taste

by Willy Ley

***Wherein** it is proven that man can, has, and probably will eat practically anything that grows or wiggles—and like it! From crushed-ant beer to intoxicating mushrooms—*

Illustrated by Olga Ley

OF MICE AND MEN

THE story goes that back in the '20s a European family took pity on an American who was about to leave for his prohibition-ridden homeland and served him a farewell dinner consisting solely of things they imagined to be unobtainable in New York. In addition to table wines and liqueurs there was wine-soup, ham in burgundy, rum-soaked preserved fruits, sweet rice in arrac and finally café cognac and rum cake. After all this the American is said to have staggered out of the dining room, declaring with a more than slightly thick voice: "We Americans only drink the stuff, but you're worse. You *eat* it!"

It matters little whether that story is true or not, fact is that the civilized menu of the twentieth century contains a number of dishes with considerable alcoholic content. But although they may cause a mild intoxication it is not their purpose to accomplish this fact, the beverages are put in mainly to provide the flavor. And there is no dish on the menu that is supposed to put you under the table.

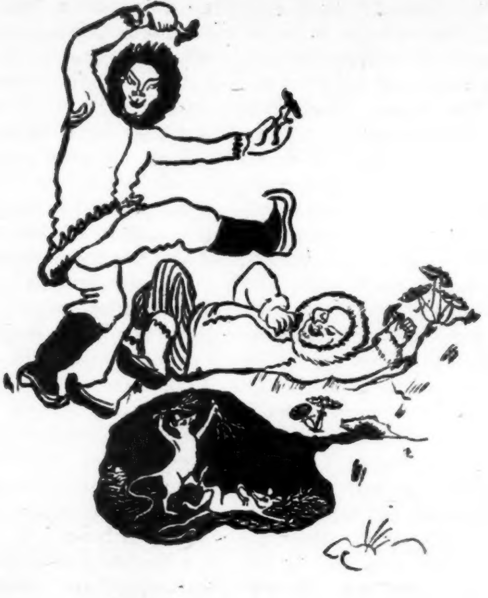
There is no such dish, that is, in America or Europe or anywhere else, with one solitary exception. That exception occurs in Siberia. It is in use among the Korjaks and the Samoyedes and since the knowledge of its existence came via Russia it is usually listed under its Russian name which is Muchomor —*mukhomórr*. The word is really only the name of a certain toadstool that can be found all over the northern continents, the one with the white stem and the flat head of polished bright red leather, decorated with little white dots. It is the standby of all fairy tale illustrations, in botanical catalogues it is listed as *Amanita muscaria.*

The dish of the Korjaks and other Siberian tribes consists simply of dried specimens of *Amanita*. They are expensive, three or four of them are worth a fox skin. But the Samoyede hunter deems this a fair price, the effects are worth that much. Chewing the dried toadstool produces a very peculiar kind of drunkenness, distinguished in its early stages by fluent bragging about physical prowess. The later stages are full of strange sensations. A man drunk with alcohol may fall over a log because he did not see it, a man drunk with Muchomor will lift his feet to step over a twig as if it were a log. Finally, this sounds familiar again, he does not make any steps at all.

When news of this strange dish first came to Western Europe botanists were more than a little aghast, *Amanita muscaria* was labeled "poisonous" in big letters. They began to investigate and found a number of interesting things. There are two varieties of this toadstool, the common red and the not so common brown. The latter proved to be poisonous under any circumstances. The former proved to be a puzzle.

Scores of people reported that they ate it regularly, after removing the red skin. Some took the additional precaution of pouring away the water in which the toadstools had been boiled. It was found that the toadstool contains two kinds of poison. One is soluble in water and dissipated during the boiling. The other, while not soluble, suffered from the heat of boiling, becoming practically inert to most people. But not to all, some still suffered a bad case of mushroom poisoning; a check-up revealed the strange fact that all those who lacked resistance were total abstainers.

It was all very interesting and wonderful material for scientific papers and reports. But it did not prove a thing about the Muchomor carousals. All the voluntary and involuntary human guinea pigs of the botanists either fell sick or they didn't, not a single one of them got "drunk." But botanically the North Central European *Amanita*



and the Siberian *Amanita* are the same, without detectable difference. Somebody's body chemistry is "wrong" somehow, a more precise answer is still lacking.

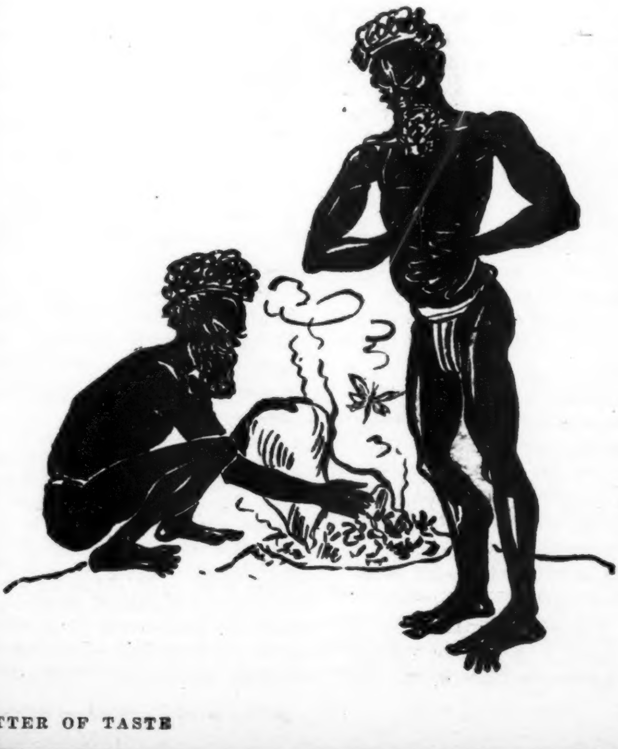
Meanwhile the Samoyedes and Korjaks and their ilk go on Muchomor sprees without even pitying the botanists and chemists. And when they recover they look, among other things, for the fairly inconspicuous signs which indicate the site of the burrows of the Siberian mouse *Microtus oeconomus*. The second half of its name refers to its habit of amassing amazing quantities of grains and seeds of various kinds in its burrows which, in turn, is the reason why the Siberians are after these hoards.

But they don't touch the horseradishlike roots which are piled up in a corner of the burrow, these roots are full of evil spirits. That, at least, is the Siberian explanation. The learned explanation says, in effect, the same, these roots are the roots of *Aconitum napellus,* the common monkshood. The toadstool-chewing Siberians know that these roots are too strong a medicine—but the mouse does not find them so. The mouse collects the roots for the specific purpose of eating itself into a stupor and it would be nice if it were possible to photograph its dreams. Because that statement that the roots are full of evil spirits is not so far off: it was *Aconitum* that was responsible for most of the fantastic dreams of the witches and warlocks of the Middle Ages.

BUTTERFLIES IN THE BELLY

Homo sapiens is an omnivorous mammal.

Most animals have a very definite, albeit usually monotonous, diet. The carnivores, as their name says, demand meat, there is no way of tempting a hungry lion with bananas or mashed potatoes. The insectivores stick to insects, although they are somewhat weak in systematic zoölogy, considering centipedes on the one hand and earthworms on the other hand as insects and therefore as dietary items. The giant anteater of South America will not touch anything of vegetable origin while his distant relative, the sloth, moves all his



life through the boughs of the trees overhead, eating, eating, eating, and nothing but leaves. Some insects have carried this trait so far that they will eat only the leaves of one specific plant and rather die than touch anything else.

But pigs, bears, monkeys and, most of all, Man, do not conforn to such restrictions. Man literally eats himself through the whole evolutionary tree—we'll talk about this later—and if he doesn't eat insects, as a rule, it is mainly because most insects are too small to provide a substantial item of his diet. But as soon as the insects are sufficiently numerous to make up for their individual lack of size that rule does not hold any more.

John the Baptist, it is related, lived for a considerable period on locusts and honey, a diet which is by no means as bad as it may have sounded to our forefathers. It probably contained all the vitamins and minerals he needed, together with enough bulk. There is no learned report on the vitamins in dried locusts yet—at any event he survived.

The land where insects are not just an occasional snack but a real item on the menu is Australia. The aborigines of North Queensland prepare a drink, somewhat beerlike in quality but also reminiscent of fruit lemonade, the base of which consists of ants. The ants in question are the green weaver ants which occur in large number in that section. Their bodes are gathered and crushed into a mash which forms the raw material of the drink. Explorers and settlers who got up enough courage to try it were greatly surprised about its pleasant taste. They discovered, to their horror, that they liked it. And while they never quite got themselves to make it with their own hands they felt no qualms when it came to them ready made.

Those tribes that invented the ant beer ate other insects, too, on occasion, but for other Australian tribes a certain insect did not only form a part of their diet for a few months of every year; it was their diet. That insect was a large and fat moth of very normal appearance, the moth *Agrotis infusa* of entomologists, the Bougong or Bogong Moth of the settlers. The moth takes its name from the Bougong Mountains where it appeared and still does appear in such numbers that vegetation and ground look as if they were covered with freshly fallen snow.

An early writer on Australia, A. W. Scott, described the so-called Bougong festival, basing his narrative on the observations of one Robert Vyner who witnessed it in 1865:

> The Bougong moths are collected and prepared for food by the aborigines, in this wise—a blanket or sheet of bark is spread on the floor; the moths, on being disturbed with a stick, fall down, are gathered up before they have time to crawl or fly away, and thrust into a bag. To cook them, a hole is made in a sandy spot, and a smart fire lit on it until the sand is thoroughly heated, when all portions left of the glowing coal are care-

fully picked out, for fear of scorching the bodies of the insects—as in such a case, a violent storm would inevitably arise, according to their superstitious notions. The moths are now poured out of the bag, stirred about in the hot ashes for a short time, and then placed upon a sheet of bark until cold. The next process is to sift them carefully in a net, by which action the heads fall through, and thus, the wings and legs having been previously singed off, the bodies are obtained properly prepared. In this state they are generally eaten, but sometimes they are ground into a paste by the use of a smooth stone and hollow piece of bark, and made into cakes.

These cakes are described as having been of a dirty cream color and very fat, so fat indeed that the generally undernourished aborigines showed all the signs of "butterflies in the belly" during the first few days. White men who tasted the cakes did not experience any such discomfort, found them to be much like a fat nut paste and generally came back for more.

These Bougong festivals are now a thing of the past. The moths still exist and come every year in numbers that could not have been any larger at any time in the past, but the aborigines have left the regions where the moths abound.

THE GOOD EARTH

During the period Wan-li (1573-1620) of the Ming dynasty, the district Tseyang was struck by a great famine. Suddenly appeared there a Taoist monk with a star cap, gourd, and sword, and pointing to a lot of waste land, said, 'Beneath this spot there is earth rice, which may

> serve as food.' He vanished at once, and the crowd regarded him a strange apparition. The people dug the soil more than a foot deep, and found earth of a bluish color, which had a flavor somewhat like grain. The famished people swallowed it eagerly, and as they greatly enjoyed it quarreled about the same piece. Several thousand men took so much of this earth away that it resulted in a pit several acres wide and about twenty feet deep. The following year, when wheat had matured, the Taoist monk came down to the same spot, as if he had something to fill out the pit. All of a sudden it was full, and again the people began to dig; however, they found nothing but sandy earth that cannot be eaten; for the fairies are crafty and make such earth only to help men.

This is not a Chinese fairy tale, but a piece from the "Records of Kwei-chou Province" and can be accepted as factual after some minor embroideries have been discarded. Nor is it the only Chinese story of that kind, there are at least a dozen of them, many of them containing a sober warning not to eat the earth rice, or earth flour, unless necessary and even then mixed with real flour or vegetables if at all possible.

Earth-eating, or better clay-eating, is an established fact as an emergency measure in times of famine in China. But that clay-eating during times of famine is only part of the whole story and the most understandable part at that. Clay-eating existed, and probably still does exist, elsewhere or rather everywhere. It has been reported from other parts of Asia than China. It has been reported from Timor and Java. It has been reported about quite a number of tribes of American Indians, both North and South America. It has been reported from Persia and Africa. In short it has been found to exist almost anywhere on earth—and it has always been a puzzle to anthropologists.*

The craving for clay and claylike substances has nothing to do with famine most of the time, in fact it seems to be a highly individual trait which, however, know no geographical or racial boundaries. In the majority of cases the clay—usually heavy bluish clay—is used by the individuals addicted to it as a supplementary item of their normal diet. Explorers, naturally, have tasted these clays and without exception have reported that they found them completely indifferent with a taste neither pleasant nor unpleasant, mostly without any specific taste at all, at best something to chew for amusement.

Some of them have ventured the guess that it may satisfy a craving caused by intestinal worms. Others have tried to find superstitious reasons for the habit and failed, except for the rather negative Chinese superstition that blue mountain clay is the food of the dragons and must not be eaten by Man. Still others had samples of the clays subjected to chemical analysis which failed to find anything of nutritive or narcotic value.

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*The most recent and generally best collection of all these reports is a hundred-page paper "Geophagy" by Berthold Laufer, Curator of the Department of Anthropology of the Field Museum of Natural History in Chicago. It is called "Publication No. 280," the price is $1.00. The Chinese story quoted above has been taken from this paper.

The attitude of the populations differs, too. In large sections of the Orient small clay cakes are for sale like candy bars—while in other places clay eaters are regarded with superstition and suspicion, they are just tolerated in the community. Naturally the real clay addict gradually kills himself off with his strange desire. The intestinal tract is slowly but surely ruined, the victims of the addiction lose weight rapidly and finally die.

FRUTTI DI MARE

Just how omnivorous the omnivorous mammal *Homo sapiens* really is can only be realized when you have a textbook of zoology in one hand and a collection of menus in the other. To begin with the mammals: there is hardly an order among them that does not contribute to somebody's menu somewhere. The lowest order are the monotremes: fried duck bill platypus was an item on the menu of the Australians. The next is that of the Marsupials—ah, fried kangaroo tail. Just above that is the order of the insectivores, fried hedgehog is the traditional meal of the Gypsy. The rodents contribute hare and rabbit, the edentates contribute armadillo—fried in the shell—the aardvark, an order by itself, got its Dutch name—meaning *earth-pig*—from the hams into which it can be converted. Elephant's trunk is said to be a delicacy, whale meat is almost a staple in Japan and the Sirenia lost one of their few members because it—Stellar's seacow—was eaten up by sailors and whalers to the last head. Of the car-

nivores only the bear is on the menu of the Ungulates—pigs, deer, cattle, et cetera, of the even-toed, tapirs, rhinoceroses, horses, zebras, et cetera, of the odd-toed—virtually every member is honored by being eaten. And the hunger does not stop with the Primates, South American monkey are said to taste good and to look bad when fried—because they look like babies. And then there is cannibalism.

As for the other vertebrates most birds are considered edible and not a single order of the fishes escaped the cooking pot or the frying pan. Of the reptiles the white man accepts only the turtle, the South American Indian includes the large iguana lizards. (The other reptiles are mostly too small, but the African crocodile is eaten by the Africans.) Of the amphibians only frogs are admitted to the kitchen.

And the invertebrates? The "animals without backbones"?

On the average it's only oyster and lobster—but now I am getting close to the *frutti di mare* of the Italians, the "sea fruits." Tourists who visited Italian ports, especially Naples, never failed to be impressed in a peculiar way by the *frutti di mare* that were for sale. If the tourists were zoologists, they took notebooks with them when they visited the sea-food market because these stands presented a cross section of Mediterranean sea life. Everything was there—except fish, which was kept separately—and zoologically speaking it was fine. Gastronomically speaking it was mostly shudders.

Small octopi flamed in all possible colors in a last death rage and they certainly did not look edible. The Italians insisted that they were and proved it by deeds. There were small yellowish clusters resembling grapes. They were the eggs of sea urchins, and edible—in a way. There were darkish blobs, the *ascidia* of zoologists. The Italian fisherman would cut them open to reveal a yolk-colored interior.

Not even all the clams looked "right" to a visitor, but he might be inclined to argue that point. And he had no objection to the various crabs, although some people insist that the eating of crabs, excepting big lobsters, is inefficient since it consumes more energy that you get out of it.

It should be mentioned here that one of the last accusations of witchcraft in France concerned an old lonely woman who was a witch because she had been observed to catch and eat abominable creatures. Upon investigation the judges of the nearest town discovered that the abominable creatures were small fresh-water crayfish, a valued item on their own table. The accusation was quietly suppressed. Incidentally those peasants who had made it in solid faith did not hesitate to eat big snails, at least as "abominable" as crayfish unless you grow up with it.

The *frutti di mare* are not exclusively Italian. There exists a Far Eastern equivalent. The *trepang* of the Chinese—apparently as much a medicine as a food item—is also a sea urchin while still alive. And the Chinese kitchen had among its strange attractions boiled shark fins. All Americans and Europeans who become acquainted with it agree that those shark fins would serve much better for library paste than as an appetizer.

But those same Americans—or their sons—are now the most enthusiastic shark killers on earth. Not because the shark is the sailor's traditional enemy. And not because they suddenly discovered a liking for that paste. But because they found that shark livers are the richest natural storehouse of vitamin concentrates known. A few drops of shark-liver oil is equivalent to a tablespoon of the traditional cod-liver oil. Which has made the price of shark liver go up to such an extent that it supports whole shark fisheries along the West coast.

ANIMAL "SPIRITS"

In the Berlin Zoological Garden there lived for many years a large cockatoo with a following all his own. The bird—I think it was a black one from New Guinea—had once been given some brandy for medicinal purposes—and promptly turned dipsomaniac. But it cannot be said that he suffered from dipsomania; on the contrary, he enjoyed it. The trouble was that some visitors had somehow learned about this condition and supplied the bird steadily with rather considerable amounts of brandy that grew as time went on. In the end the management did not care any more, and the bird became a horrible example, I have been told that he came in for dishonorable mention in some sermons.

When I said that I *think* that it was a black cockatoo I did not mean to imply incomplete memory. I meant to imply that one could not tell. He had only a dozen or so feathers left on his body and those did not show any definite color of any kind.

But the featherless and permanently drunk cockatoo not only provided raw material for sermons, it also formed the starting point of learned discussions. It had an influence on the science of animal psychology and helped to decide an important problem in that field. Some animal psychologists had made up their minds at that time—some thirty years ago—that animals lack "useless emotions." They feel pain, of course, and they follow the dictates of hunger, thirst and sex, but they are quietly "efficient" outside of that. They don't go in for exercises—at least that is what that group of armchair scientists asserted—but move only when there is a purpose, like hunting prey or seeking a female or escaping from danger. In short they were not given to useless activities—it was said—everything they did made sense.

The other side admitted that animals do not write lyrical poems, but insisted that even grown-up animals play and do things which disagree with so strict a definition of "purposefulness." The cockatoo was a case in point, he could not happen if animals were actually so coldly efficient as asserted. Naturally the validity of the featherless cockatoo was denied. In the first place it was a caged bird. Naturally the influence of captivity would change the true picture. Besides there is no brandy in nature, especially not in New Guinea, brandy being itself a product of civilization.

It was not a very clever argument, those "radicals" who stated that animals will do useless things just like Man, gleefully began to dig in their files and turned up the most amazing stories of natural liquors of all kinds and the response of the animal world.

There are certain palms in the tropical zone which, when cut, produce a powerful toddy, appreciated by natives and white men alike. And that appreciation was shared by monkeys, lemurs, bears and even tapirs, depending only on the locality, who robbed the containers fastened under the cut and were often found soundly asleep in the immediate vicinity, provided the containers had been full enough. As a matter of fact most of the small and shy lemurs which reached zoological gardens had been caught by way of such fermenting toddy, some of them deliberately baited, others just collected on the scene of their misbehavior.

To these stories of animal catchers entomologists added their own about so-called "butterfly bars." Such butterfly bars can be found anywhere where there are birch trees. In spring the birch tree "bleeds" profusely when the bark is scraped off by some accident. The phenomenon is not restricted to that season, but it is most pronounced then. And the sap, rich in sugar, ferments quickly and acquires alcoholic properties. The result is that each such tree wound becomes the scene of almost indescribable carousals of insects, mostly butterflies and beetles. Rare beetles which are usually caught only by lucky accident, suddenly appear in numbers around such a "butterfly bar." Butterflies which are not even known to exist in a specific locality—where such a "bar" happens to spring up—can be found there, proboscis deep in the fermenting liquid. They cannot just be found there, they can be caught without any trouble, most of the time they are too drunk to fly and just barely manage to hang on. If they are pushed out of the way by newcomers who are still in the full possession of their strength, they just tumble to the ground without even opening their wings. They fall just like a dead leaf, and like a dead leaf they lie where they fall.

(Needless to say that butterfly collectors in the tropics do better with a quart of strong wine than with a whole day of ordinary hunting.)

If the fermented sap is strong enough to overcome even the powerful instincts of insects it is clear that larger animals, not so well fortified with instincts, succumb at least as easily. If they are too large, their size and weight fortifies them, the alcoholic content is not strong enough to produce noticeable disorder. But squirrels are not too large; even the shy red variety gets to a state on occasion where it can simply be gathered up and where it does not even fight back.

Of course the beetles and butterflies and squirrels have to wait for an accident but another denizen of the forest is in a more advantageous position. It is the woodpecker. Otherwise reliable men have stated repeatedly that they observed woodpeckers busily chiseling holes into birch trees. Not for the purpose of hunting insects under the bark, as they usually do, but clearly and simply producing a bunghole in the barrel, in expectation of things to come.

THE END.

IN TIMES TO COME

If you remember Don Channing's solution to the problem of "Calling The Empress," one-way Venus Equilateral-to-ship communication was established by driving the high-power beam from Venus Equilateral at a mathematically calculated point in space which should be occupied by the ship if it were following its proper course. A very fine system—so long as the ship did, or could, follow that course. Don Channing himself was aboard the ship that didn't—the ship that, instead, lit out for interstellar space under a 10-G drive after a hunk of scrap iron known as a meteor wrecked the controls and shorted them "full on." The damage to the ship wasn't really serious—just a little wiring repair called for. But you can't do any repairs, can't do anything but lie down and groan, when you weigh some fifteen hundred to two thousand pounds. By the time the driver cathodes gave out—the new spares had just been installed—the ship was headed nowhere in particular at a speed they couldn't halt. They were already off the beam, couldn't communicate anyway, and rapidly getting out of the Solar System.

It was easy to repair the ship well enough to astrogate; it would be easy for a relief ship to bring a new set of driver cathodes that could halt the crazy flight and bring them back to Earth. Absolutely all they had to do was to call up Walt Franks and tell him about it—

THE EDITOR.

THE ANALYTICAL LABORATORY

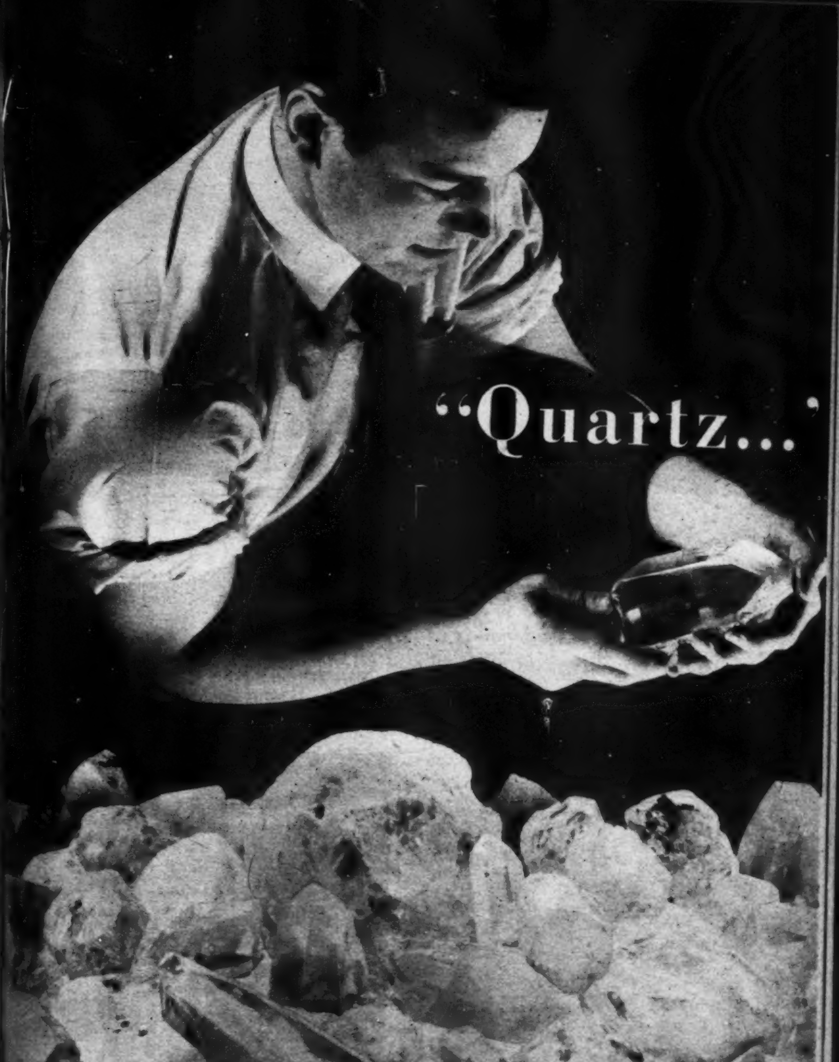
Again my thanks; the readers sent in a more than usually noble collection of vote-letters this month. If the results tabulated below do not agree with your own personal choices in the matter, I suggest that it is evidence that too few readers of your turn of mind sent votes. According to the theories of statistical analysis, I should get not less than seven hundred letters to have an adequately accurate sample of the "universe" involved—the readership of Astounding. Despite improvement, the number does not approach any such level. A post card listing the yarns in 1-2-3-4-5 order is all that's needed.

The votes on the November issue stand:

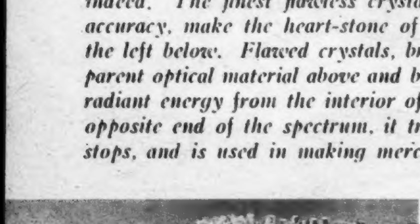
Place	*Story*	*Author*	*Points*
1.	Recoil	George O. Smith	2.12
2.	The Beast	A. E. van Vogt	2.14
3.	Death Sentence	Isaac Asimov	2.91
4.	Gallagher Plus	Lewis Padgett	3.00
5.	If You Can Get It—	Murray Leinster	4.70

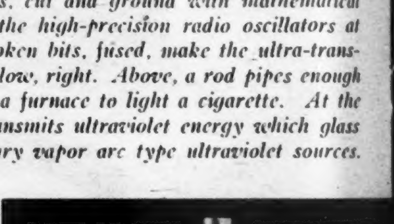
Incidentally, "Death Sentence" was the only story that didn't get at least one vote for fifth place. Opinion scattered pretty widely—

THE EDITOR.


"Quartz..."

Every rock is part quartz—but pure crystalline quartz is precious stone indeed. The finest flawless crystals, cut and ground with mathematical accuracy, make the heart-stone of the high-precision radio oscillators at the left below. Flawed crystals, broken bits, fused, make the ultra-transparent optical material above and below, right. Above, a rod pipes enough radiant energy from the interior of a furnace to light a cigarette. At the opposite end of the spectrum, it transmits ultraviolet energy which glass stops, and is used in making mercury vapor arc type ultraviolet sources.





Postwar Plan for Mars

by R. S. Richardson

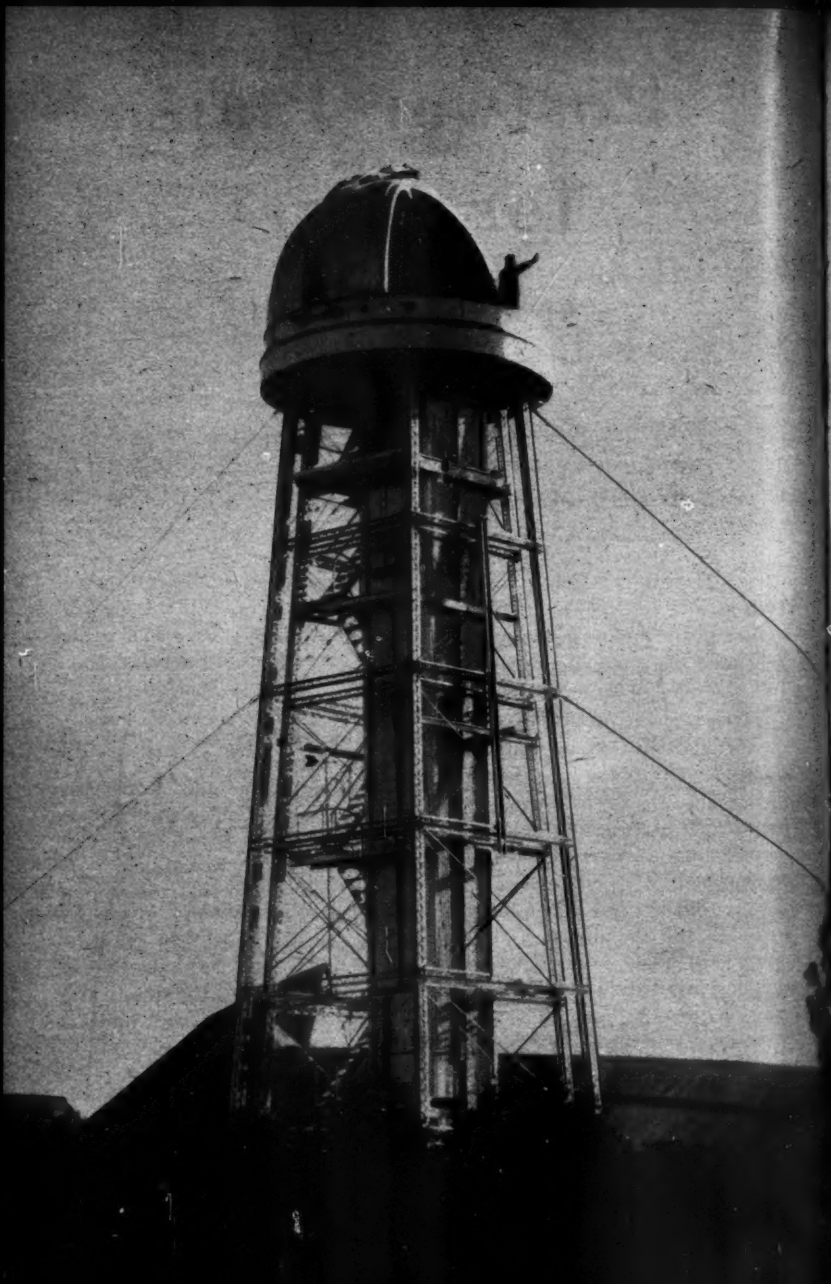
***Not** the God of War—the planet. Very little research on the planets has been done in recent years—the far stars have seemed more intriguing. Richardson suggests how a plan of astronomical research is laid out.*

It was visitors' night on Mount Wilson and the regular illustrated lecture in the auditorium of the observatory was drawing to a close. In a series of lantern slides the audience had been transported from the vicinity of Pasadena, California, to the photosphere of the sun; thence outward for a brief stop at each planet in turn, until finally immersed amid a welter of star clouds and nebulae.

Now the lecturer was returning to Earth and the audience was beginning to fidget in anticipation of the long-awaited climax of the evening: a peek at Mars through the sixty-inch reflecting telescope.

"Before starting for the dome," the lecturer admonished, "I want to call your attention to this view of Mars, the object selected for observation tonight. Notice this brilliant white spot. It is the giant ice cap of the planet. Remember, when your turn comes at the telescope, be sure to look for the ice cap on Mars."

Later, standing on a platform by the Cassegrain focus, he watched the people as they filed slowly past for their ten-second glance through the eyepiece. Now and then a visitor stopped for a question. To those who expressed disappointment at their inability to see the canals he had a word of sympathy—he had never been able to see them himself. For the fiftieth time he explained that nobody knew if there was life on Mars, the Sunday supplements notwithstanding. There were nights when he was certain he had heard every remark the public could possibly make about Mars.



The tower of the solar telescope at Mount Wilson Observatory. The coelostat in the dome directs a beam of light down the central shaft to the observation chamber below.

An old lady was peering into the eyepiece now, trying to see across thirty-eight million miles to Mars, and retain possession of her hat, purse, and spectacles at the same time. She looked long and hard, first with one eye and then the other, but apparently without much result. At last she turned to the lecturer and addressed him in a thoroughly disgusted tone of voice.

"I can't see any ice cubes on Mars!"

This incident,* which actually happened, illustrates the foremost qualification an astronomer must have in order to rate as a first-class Martian man: absolute honesty as to what he is sure he can see on the planet. For undoubtedly Mars is the most tantalizing thing in the heavens at giving an astronomer a flash into his mystery and then slamming the door in his face. He wonders with a wild surmise what it was he really did see in that split-second interval, while the conviction grows that if his telescope were just a trifle bigger, and the seeing just a little better, he could finally pierce the veil.

On December 5, 1943,* at 2 p. m., Eastern War Time, Earth will gain another lap on Mars in its eternal race around the Sun. As Earth in its orbit swings past Mars and forges ahead they will be separated by 50,502,000 miles of void. A lot of miles but still the closest approach since Mars was last "in opposition"—opposite the Sun as seen from Earth—in October, 1941, when it was a mere thirty-eight million miles away. However, the extra twelve million miles this time will be partially compensated by the much greater altitude of the planet. One of the anomalies of life is that if you manage to make a gain in one direction you generally lose out in another. Similarly, when Mars comes closest to Earth it is always so far south that astronomers in the northern hemisphere can seldom get a really good look at it. But during December of 1943, Mars will ride high overhead, the brightest star in the evening sky. It is in the constellation Taurus near the first-magnitude star Aldebaran. Since Aldebaran is a fiery-red K5 star, the two will glow side by side like twin stop lights.

Mars during December will be at the position in its orbit when one of the strangest phenomena on its surface was claimed by the discoverer, Schiaparelli, to be most conspicuous—the gemination or doubling of the canals. For when you look at Mars, although it is

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*Readers should hear some really good ones, such as the visitor who wanted to know "where you go to look through that big stethoscope."

*Closest approach is not exactly at opposition. Mars will be closest to the Earth on November 28th at 9 a. m., E. W. T., distant 50,118,000 miles.

Visitors' night at the 60-inch Hooker telescope on Mount Wilson. But don't rush out to get a peek; the custom has been discontinued for the duration.

wintertime here, springtime is coming in the northern hemisphere there, the Martian date corresponding to about March 1st. And the gemination affecting only about ten percent of all the canals is produced principally "in the months preceding the great northern inundation, at about the time of the equinoxes." Parallel lines running like railroad tracks over hundreds and thousands of miles of planet! No greater triumph for the camera can be imagined than a photograph that would confirm this effect beyond the suspicion of a doubt.

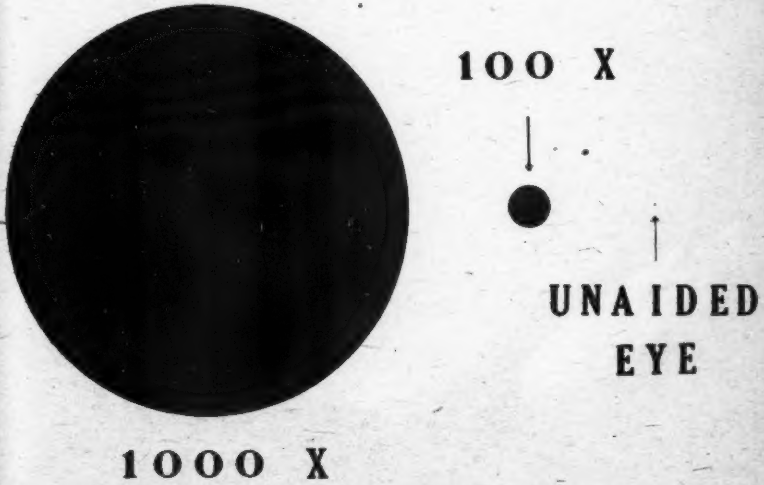
Can't you picture astronomers busily readying their instruments in preparation for the few weeks when Mars will be most favorably placed for intensive study? Working with different combinations of emulsions and color filters, limbering up old plateholders and focusing gadgets, testing developers for fine grain and contrast? Poring over the maps of Mars upon which are inscribed such magical names as *Solis Pons,* *Meroe Island, Syrtis Major, Phison* and *Deucalion?* Rereading *La Planète Mars* and *Mars and Its Canals?*

Well, brother, if you have any such hallucinations of feverish activity among the astronomical fraternity as opposition nears, then signal for a new slide right away. For not only do astronomers neglect Mars at a moderately good opposition such as this one, but even at the extremely close fifteen and seventeen-year oppositions when Mars gets inside the thirty-six-million mark.

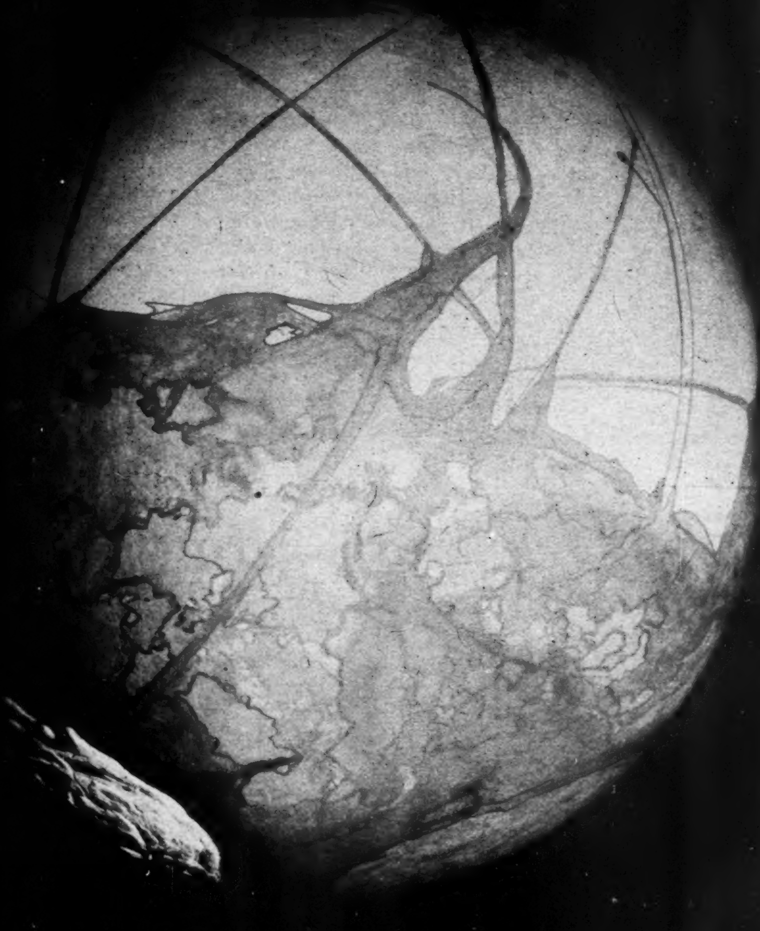
A Gallup poll taken among astronomers at the present writing—September 15th—would probably break down about as follows:

Question: What special observations of Mars do you plan to make at the coming opposition?

Had planned no special observations (forty-seven percent didn't know Mars was coming to opposition)	60%
May get around to making a few sketches	14%
Promised to show Mars to school children in neighborhood if weather O. K.	12%
Doubts whether worth bothering with Mars at present opposition (besides motor on clock drive burned out and unable to get priority for replacement)	10%
Intend to photograph Mars in light of different colors;	



Comparative size of the image of Mars as seen by the naked eye, in a 6-inch telescope—enlarged 100 times—and as the 100-inch Mount Wilson telescope can show it—enlarged 1,000 times—on nights of good seeing.



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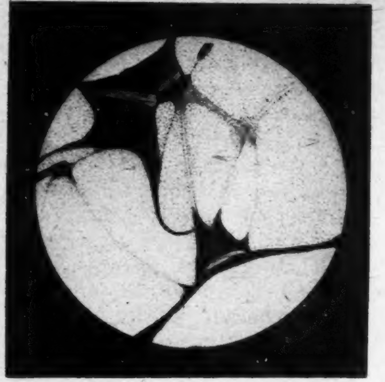
I can still recall my shock and disappointment when an astronomer first told me that less than five percent of their program was devoted to the planets. For to me—and I know from numerous conversations that others are in agreement—the planets seem by far the most fascinating objects for study in the whole heavens. Upon opening an astronomy text I always immediately hunted for the chapter on *The Planets.* The sections on *Methods of Determining Latitude* and *Precession and Nutation* were doubtless necessary in the proper study of astronomy but somehow they lacked sustained reader interest. True, the stars and nebulae had a certain appeal, but they were so darned big and far away it was hard to get very excited about them. Always you turned first to *The Planets,* especially the part captioned "Habitability."

The reason for this lack of professional enthusiasm for other worlds is, strangely enough, the inherent difficulty of finding out anything new about them. It takes so much persistence and luck to get an observation that is genuinely different from thousands that have been made before you. But you can turn a spectrograph on the sidereal heavens and immediately be on the trail of some problem in astrophysics that is crying for an answer. What is more, you can often get the answer, or at any rate enough of an answer to satisfy the world for a couple of years.

But consider a young astronomer just starting his career—we will suppose him in 4F due to chronic somnambulism—who has been persuaded, perhaps against his better judgment, into specializing on the planets. He begins by drawing the markings on Mars and Jupiter. After five years his hand and eye have become sufficiently trained so that he can detect and record planetary detail with considerable assurance. He has identified most of the points on Mars described by eminent areographers of the past but has recorded nothing of note himself. His color photographs of Venus reveal interesting differences in the red and violet, and he has one series of Kodachrome on Jupiter during "Seeing 7" of a violent outburst in the north tropic zone. He is at present designing a camera with which he hopes to catch the rapid changes in transparency of the Martian atmosphere. But except for half a dozen notes in the *Publications of the Astronomical Society of the Pacific* and *Popular Astronomy* he has nothing tangible to show for his five years of labor. And the trouble is, even if he were lucky enough to be looking when something exciting hap-

Photograph of a globe-map model of Mars, based on drawings and observations, but considerable fine detail and third dimension "filled in."



A pattern may well appear like this, when viewed from a considerable distance, when a closer inspection—

pened on Mars, it would be next to impossible to make anyone believe him unless he could get a photograph. For astronomers of today are so camera-minded that, unless you can photograph it, you might as well forget it.

To illustrate these obstacles to planetary study, let us consider the old question of the canals on Mars, which is little nearer solution than when Schiaparelli casually announced their discovery in 1877. To show what a planetary investigator is up against, let me recount the events of a certain night at the last opposition in October, 1941. My only excuse is that I believe they may possibly be unique in the history of Martian annals. At least I doubt whether anyone has ever looked at Mars so hard in so little time with so much. The experience was all the more impressive to me in that it developed quite by chance.

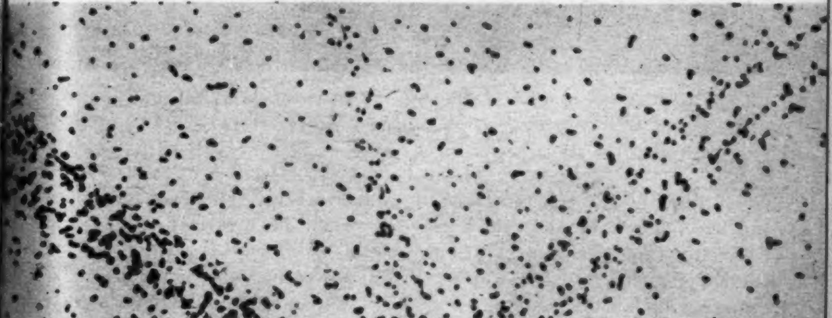
I was on Mount Wilson doing the solar work, which, since it necessarily came during the daylight hours, left me at a loose end in the evenings. I was anxious to get my first good look at Mars, but since the sixty-inch and one-hundred-inch telescopes were both tied up with men doing direct photography, I knew only too well the futility of trying to break into their programs. But there is a little six-inch refractor on the mountain that is seldom in use. With this instrument I had been amusing myself by trying to identify the grosser markings on the disk. Being completely green at this kind of work, I had found it required more skill than I anticipated. To make matters worse, the "seeing" or degree of steadiness of the atmosphere had been consistently bad, a fact which was readily obvious from my notebook. So far my drawings showed nothing but such features as the polar cap, the Syrtis Major, and the region around the Sabaeus Sinus.

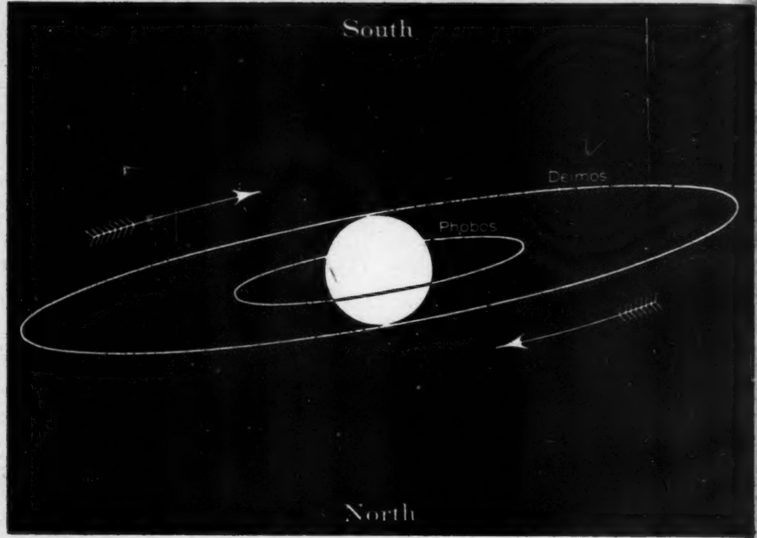
On this particular evening, however, Mars came into focus hard and keen. Details which before had been caught only by glimpses after long waiting now could be held easily for several seconds. I changed from a power of one hundred, which before had been all the seeing permitted, to the highest-power eyepiece of the set, giving a magnification of three hundred, and found the disk still clear and sharply defined.

My previous drawings had been rough, half-hearted affairs. Now I got to work in earnest. One who has never tried to draw a planet can have little idea of what a discouraging job it can be. You soon develop a deep sympathy for artists who specialize in small rapidly moving animal life like squirrels and leopards. For even on the calmest nights the disk of a planet is in continual agitation like a basin of mercury. Details shift about, come up strong, fade, then disappear. I wonder if any astronomer of the pre-photographic era ever felt really satisfied with one of his drawings.

It is hard to keep from getting a little stirred when the seeing begins to settle down in this way. I was glimpsing markings of amazing intricacy never before suspected although I had carefully scanned this region a dozen times. Occasionally

—would show the actual pattern was of this nature. The halftone type of photographic reproduction depends on the eye's trick of blending detail to form a pattern; look at the cover of this magazine with a magnifying lens.





The orbits of Mars' moons—Fear and Flight. Astronomical maps usually invert the usual north-south order since optical systems invert the image.

there would be a flash of linelike structure but nothing I could honestly call a canal. But with just a little more aperture—. It was exasperating on so fine a night, one that might never come again during opposition, to be limited to a six-inch lens.

What to do? For a minute I entertained the notion of propositioning the stellar observers for a brief look but as quickly gave it up. After all, I knew how much I resented one of them interrupting my solar work and could scarcely blame them for feeling the same. Then came an idea I should have gotten in the first place. Why not look at Mars with the sun-tower telescope? It would be awkward but still it could be done. I started for the sun tower at once.

The sun-tower telescope is sixty feet tall with a dome on top that often causes it to be mistaken by visitors for a water tank. Within this dome which can be opened to the sky are two mirrors. One mounted parallel to the Earth's axis called a coelostat is turned by clock-

Mars, as seen from Phobos, would make the most spectacular landscape in the System. It's a small planet —but very close to tiny Phobos.

work so as always to follow the sun once it is set upon it. The coelostat mirror reflects sunlight to the other fixed mirror mounted over a sixty-foot shaft. This in turn reflects the beam down through a twelve-inch lens to the base of the tower where the image is formed. It is easy to set the mirrors on the sun in broad daylight, as easy as reflecting light from one looking glass to another.

But on a dark night it is a clumsy piece of apparatus to get lined up on even the brightest star. Much maneuvering of the two mirrors back and forth is necessary in order to pick up the star in the coelostat mirror and reflect the invisible beam onto the center of the fixed mirror. After that you must hang headfirst over the sixty-foot shaft and look upward into the fixed mirror above to make sure light from Mars is coming down onto the lens at the right angle. But eventually the mirrors were properly set and clamped into position.

Mars through the sixty-foot sun tower was a distinct improvement over the little refractor. The colors were much more vivid; in fact, Mars looked more like a beautiful miniature globe delicately tinted with pink and olive than a faded dying world. Again there were tantalizing seconds when tiny dots and wisps of lines flashed out, but still nothing definitely canallike. I decided to try another sketch.

For some reason it proved more unsatisfactory than before. When compared with my first drawing it differed so radically at certain points that I decided to return to the six-inch for a recheck.

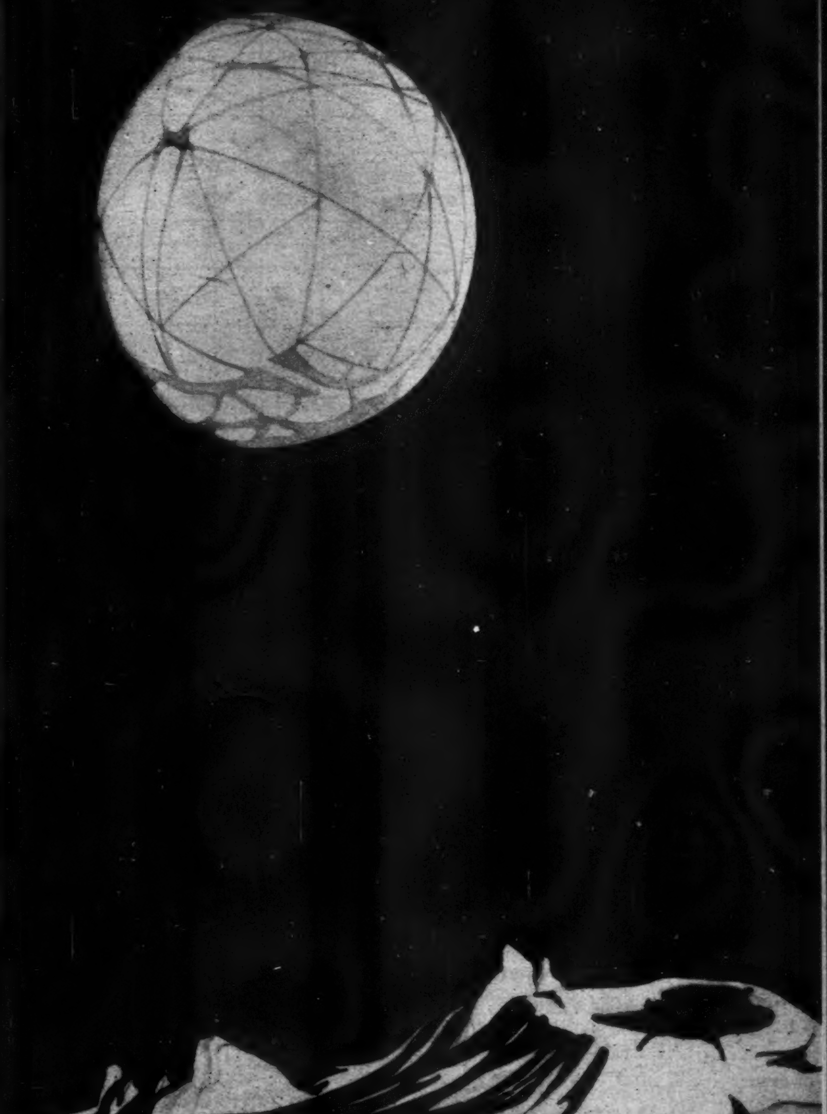
But it was not to be. Upon approaching the dome I heard voices, one of which I recognized as that of a staff member. Evidently he had brought some friends up the mountaintop for a look through the telescope, a frequent and highly economical method of entertaining visiting firemen. But at just the wrong time for my Martian researches.

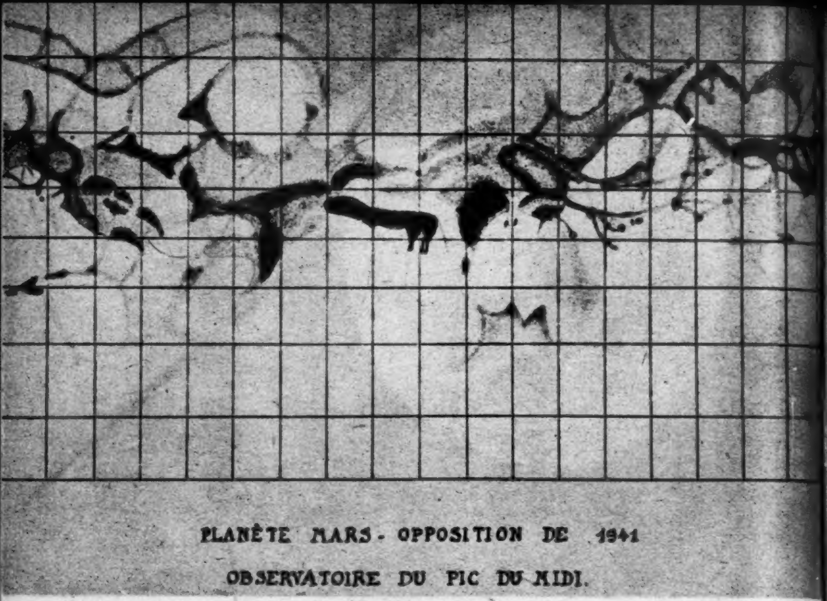
While debating whether to barge in or not regardless of company, the unexpected happened. The astronomer at the sixty-inch, noticing that someone was entertaining visitors and having an hour to spare, came over with a blanket invitation to join him at the big dome. He had just gotten set on Mars. Would we like to come over and have a look?

The old sixty-inch, although scarcely rating the appellation of "giant eye" with which the newspaper boys are so fond of tagging a large telescope, nevertheless is one of the largest active reflectors in the world today. Schiaparelli saw the canals with an 8½-inch refractor. There should be hope for me with a sixty-inch mirror.

The increase in aperture was very

As seen from Deimos, Mars would still be spectacular, but ringed Saturn seen from one of its inner satellites would be still more impressive.




PLANÈTE MARS - OPPOSITION DE 1941
OBSERVATOIRE DU PIC DU MIDI.

One of the most recent maps of Mars, drawn both from direct observation and multiple-image photographic-process prints. The original photographic prints have not yet been smuggled to this country from France.

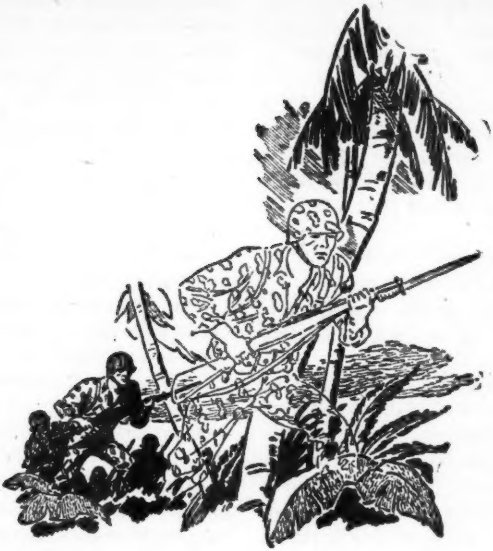
obvious—Mars was intensely bright—and there was detail galore. The south polar cap was dazzling. At times the seeing would become so nearly perfect that the disk would freeze into immobility and the markings would stand out with the sharpness of an etching. Then, like a motion picture abruptly halted in the middle of a scene, the disk would come to life again as atmospheric tremors began their agitation.

But the canals were as far away as before! I strained my rods and cones to the limit but not one canal could I see.

And this in spite of the statement by many authorities that the canals are not especially difficult objects! "Personally I am quite convinced of the reality of the great majority of the so-called canals," wrote Major Molesworth in 1903, referring to his studies in Ceylon with a thirteen-inch reflector. "I think I could have convinced the most skeptical on this point if they could only have spent an hour or two at my telescope on some of the perfect nights in March and April of this year."

Well, for my part, I would certainly like to have taken the major up on that offer, even if it meant

Continued on page 169



Alias the Living

by Frank B. Long

***They** who fought on ahead through the tangled jungles drew the fire of the hidden snipers. But they who thus served as living targets—couldn't die!*

Illustrated by Orban

THE five leathernecks moved cautiously through the jungle, keeping their eyes riveted on the three-dimensional images which had preceded their physical bodies through a rift in the underbrush.

The images had been projected solely as a feint—to lure the enemy from cover. But Private Jimmy Norse, the second soldier on the right, had given a great deal of thought to the possibility of inducing *his* image to greet the enemy with a Bronx cheer.

He couldn't figure just how that could be done, though. Images couldn't speak, and—he wasn't a ventriloquist.

Leatherneck Norse, green in a green jungle, creeping stealthily forward with an image projector strapped to his waist, swabbed a perspiring brow, and smiled grimly to himself.

"I'd be satisfied," he thought, "if it would just let out a burp."

"Hold your image steady, soldier," came in a hoarse whisper from Jimmy's right.

It was followed by a "Aw, pipe down, sarge. He's doing all right."

Three-dimensional images projected through the jungle to deceive the Nips! Who'd have thought a Marine would have to worry about keeping his image in line back in, say, 1943?

Yep, images were really something.

Images—and more of them were coming. More projectors were on the way. American inventive genius could top anything the Sons of the Rising Sun could think up. Images were solid-looking, not transparent, and when you threw them out they stayed keen until the Nips swarmed out like nasty little hornets and all hell started popping.

Even then they stayed keen, bobbing up in the fray beside leathernecks stripped to the waist, sweating and bronzed and earnest behind machine guns chopping out a pattern of death from eagle nests concealed in the underbrush.

Jimmy's lips tightened and he stared straight before him. There were continuous, sodden whines from somewhere up ahead and he'd noticed with a shudder that wherever the sky showed, red smudges blended with the tangled green skein of the jungle.

"Hey, sarge, I just thoughtta somethin'," came from Jimmy's left. "Them boids o' paradise is gonna be fooled, too. They'll unload on our images, and—"

The observation was interrupted by a harsh screech, and a flutter of green-gold wings.

There ensued a silence—followed by a soggy plop.

Then, from Jimmy's right "That so?"

Sergeant Kilgallen's voice had a cultivated edge to it—an edge such as a man might cultivate by swearing continuously for twenty years while nicking himself with a rusty razor at the bottom of a well.

"Aw, sarge, it was just a coincidence. How was I to know—"

"Listen, Flatbush. The next time you give a bird that size ideas, I'll twist you up like a pretzel."

Images. Images could camouflage troop movements up to two hundred feet, and when you threw one out you became—two men creeping stealthily through the jungle. The most amazing thing about an image was its vitality. You could cut the beam or the projector could be smashed, and the image would go right on traveling. For sixty, eighty, a hundred feet!

An image had no life of its own, of course. But it behaved as though it had—and how! When you moved it moved, when you stopped it stopped, when you scowled it scowled and it could duplicate even your facial contortions when you picked up a tick, or stumbled on a hara-kiri incident in the depths of the jungle.

And that up-ahead self had one advantage over your flesh-and-blood self. Being a mere force-shell projection built up from your reflection at the periphery of an infra-beam, it couldn't be harmed by machine-gun fire or anything the enemy could do to it. It couldn't be stopped while there was life in your flesh-and-blood body, and the projector remained in operation.

Images. Images had covered themselves with glory in the Battle of Germany, and legends had grown up about them. Even now, though the paranoiac of Berchtesgarden had lain for two years in his grave, there was one story that had crossed the wide Pacific, and was still good for a laugh.

At the storming of Berchtesgarden a young American tank-corp officer had dropped to his knees beside a gray, bullet-riddled wall, and pointed his projector upward.

The image had moved in a straight line past a blaze of machine-gun fire, over a sloping marble terrace, through a window stained red and across a great hall where shadows clustered thickly.

The image had walked right up and—exploded. *Blang*—right in the Fuehrer's face!

"On your toes, men! Here it comes!"

Jimmy's heart stopped and all over his body sweat pores started opening.

From the green forest hell mottled uniforms were erupting. Above the uniforms were puff-adder faces, dirty brown in hue and remarkably alike in expression. Inside the uniforms were sweaty, small bodies inured to warfare that was admittedly nasty in all its aspects, but—so sorry—pleasing to the Son of Heaven.

For seconds that seemed to drag and tear at him Jimmy stared through the greenness at the attack on the images, gripping his rifle firmly while he steeled himself for what he knew was coming.

He wasn't a physical coward. He was sure of that, but when the enemy wouldn't surrender you had either to kill or be killed. And such a finality of choice was spiritually a little sickening. It was—

The Japs were blazing away at the images now. For perhaps ten seconds they blazed away, and the images didn't drop. Then, for one awful second, they held their fire, and in the silence which followed Jimmy could hear them hissing like snakes.

"All right, men! Go to it!" Sergeant Kilgallen shouted, and it seemed to Jimmy as though he were standing a little apart watching himself and his companions leap into action.

He had never heard five Garands start up with such a blaze of fury.

The fact that he was holding one, and was running and crouching and firing made no change in the way he felt.

It seemed not a little strange that he could feel so detached when Japs were dying all about him. It seemed not a little terrifying.

He saw a dirty brown face go, screwing up toward a shot-away ear before slithering away out of sight. Down on his stomach a Nip officer was dragging himself toward his ancestors, his breath making a whistling sound. Another was rising with a jerk.

In the forehead of the rising Jap a small black hole appeared which seemed to twist and glisten. Then—the Jap's cheekbones turned red, and his jaw melted away.

Is-My-Face-Red rose perhaps three feet, swiveled about and thudded to earth directly in Jimmy's path. Jimmy hurdled the horror in a flying leap, and charged on into the midst of the fray.

He was fighting like something possessed now, and so was the lad by his side—Private Bill Smedley. Smedley was relying almost entirely on the semiautomatic action of his Garand. He was pulling the trigger continuously, and the exploded cartridges were falling out of the gas tube at split-second intervals, and his tall body seemed almost to be gliding forward with the speed of light.

A yell of harrowing intensity came suddenly from the underbrush, and someone shouted: "Clubbed rifles, men!"

Jimmy started to reverse his weapon and then, for some reason, thought better of it. He perceived suddenly that Smedley had turned his head and was looking directly at him, his eyes strangely wide.

"Hey, watch your target!" Jimmy yelled, but Smedley seemed not to hear.

Neither did Sergeant Kilgallen and the others seem to hear. They were slowing down, and he was speeding past them, but they did not even turn their heads as Smedley had done.

The surprise attack had taken a grisly toll of Japs, but suddenly, from somewhere on Jimmy's right, a burst of machine-gun fire came out of the greenness.

When Jimmy heard it something inside him went cold, and he tightened his clutch on his rifle and swerved sharply. Often the chatter came when victory seemed certain, from weaving patches of light and shadow at the edge of the jungle. It was a thing to be dreaded because it was so mobile—so small and mobile and deadly a thing to be moving in shadows.

Jimmy had hoped not to hear it, but now that it had come he hadn't a doubt as to what he must do.

Somewhere in shadows was a solitary Jap lying flat on his stomach, spraying out death from a little mottled snake of a machine gun that could be moved about like a child's toy—an air-cooled midget job that could spray out small-caliber bullets with deadly accuracy in a wide arc for thirty seconds.

A few short bursts, and it was through. But three of the seconds were gone even as Jimmy swerved, and Smedley was on his knees, his eyes even wider than they had been, wide and glassy, and—there would never be another sunrise for Private Bill Smedley.

Japs fought like malign devils because their officers yelled at them not: "Do you want to live forever?" but "What have you to live for?" It was funny, but Jimmy thought of that as he swerved. A difference in psychology that cut very deep, an innate something in the Jap character that made life a burden and a horror.

Well, that little sadist there in the underbrush was going to be made very happy. Jimmy hadn't a doubt of it now, for something had happened to him to change him from a sensitive introvert into a man whose eyes were shining with the joy of battle.

Into greenness he plunged, ignoring the prickly thrust of the vegetation, his Garand upraised in readiness for the kill. There was a red gleam, the gleam of red sunlight, on the tip of his bayonet, and his uniform seemed to give off glints too as he breasted a withering blast of machine-gun fire at nearly point-blank range.

He was leaping forward *despite* the staccato blasts which kept streaking toward him from a chewed-up patch of jungle a yard from his face.

A yard from his face the forest was dissolving, and through the shot-away foliage he could see the mottled little snake now. It was spitting death continuously, and the Jap behind it was lying flat on his stomach with his lips split in a ghoulish sort of merriment. Or so it seemed until Jimmy lunged downward, and the Jap leaped up with a frenzied screech.

Jimmy's brain echoed the cry as he drove his bayonet home. He shut his eyes, feeling his muscles tighten, his teeth come together.

Beneath him twigs crackled, and he was vaguely conscious that there was a rustling all about him, as though the foliage had been pierced by tiny swords.

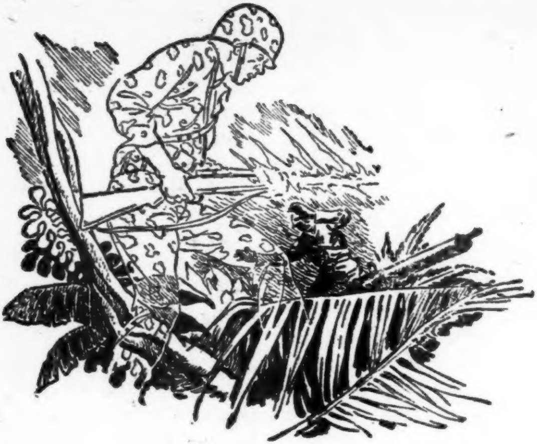
For an instant he stood without movement, his rifle slanting downward, wondering, dazedly, why he felt no horror beyond the stunned moment of shock which always came when the enemy ceased to struggle.

Always before there had been a resistance, a dead weight pressing against him, chilling him to his vitals. Now there was no resistance—nothing. For an instant something impalpable had writhed on his bayonet, but you couldn't call it a resistance.

A coldness was creeping into his brain. The enemy didn't seem to have any substance. Always before he had found that by keeping his eyes tightly shut he could think of the enemy as a . . . a darkness. But always before there had been a—

The Jap shrieked again.

Jimmy opened his eyes, and stared with a dull sort of amaze-



ment. Not only the bayonet, but the barrel of his rifle as far up as the cartridge expulsion tube was buried in the Jap's stomach.

But though the Jap's eyes were wide with terror, though sweat stood out in great beads on his forehead, there was nothing in his expression to indicate that he was undergoing the torments of a bayoneted man.

And he wasn't staying impaled! He was moving swiftly backward, his lips drawn back rigidly from his square, decaying teeth. First the tip of the rifle came into view, then a glint of cold steel, and finally, the long, untarnished blade.

There wasn't the least sound as the Jap went staggering backward through the underbrush, his features convulsed with terror, his palms clamped to his eyes as though to shut out an intolerable sight.

At first realization came to Jimmy as the dimmest gleam. It came from the bayonet which he still held in his hands, a shimmer of transparency where the sunlight caressed the steel and dappled it red and gray.

It came more fully when the bayonet began to glow and crackle, and with a stupefying rush when he perceived that his hands as well were transparent and aflame.

Looking down over himself he saw that his entire body was dissolving in flame. It was as though he were being cremated as he stared, and even as his body burned his thoughts grew brighter, sharper, and his hearing became abnormally acute.

The Jap had turned and was fleeing through the jungle as though pursued by a legion of devils armed with fiery swords.

"In-Ki," he was shrieking. *"In-Ki! In-Ki!"*

It seemed to Jimmy that he had never felt so calm. He felt neither pain nor terror nor any of the emotions which a dying man might be expected to experience at such a time. There was a strange peace in the depths of his mind and a confidence of victory such as he had never known.

It was followed by a soaring, as though his thoughts had all flown out of his mind, and were ascending like battle birds through the sun-reddened jungle.

Yank battle birds. Eagles of the dawn. Remember Bataan. Good-by, mamma, we're off to Yokohama. Higher, higher, into the dawn.

His thoughts rising higher, faster, spinning high above the jungle. And down below a Jap machine-gunner running shrieking through the forest and the last flaming vestige of himself, Jimmy, Jimmy himself, disappearing even as his thoughts were suddenly a stillness in the depths of the sky.

Jimmy helped himself to a cigarette from the crumpled package which Sergeant Kilgallen was holding out to him. His shoulder was still painful, but when he glanced down at the bandage which he had worn now for ten hours he felt a twinge of something that made him forget his pain.

He took as much pride in his wound as he had taken in his image before—

He stared around the base hospital at the other lads. They were all veterans now. They had all been wounded in action, and it would show in their eyes when they went back in.

Sergeant Kilgallen was having trouble with his speech again. He'd moved closer to the cot, and was looking at Jimmy pleadingly.

"Look, kid, maybe . . . maybe if we just went over it again—"

Jimmy sighed heavily. "O. K., sarge. A split second after you gave the order to attack I caught a slug here"—he tapped his shoulder—"and had to miss the show."

"I know, kid—I know. But how could your image do what it did when you were out like a light. I tell you, it's driving me nuts."

Jimmy sat silent for an instant, staring down at the glowing tip of his cigarette.

"What was it that Nip kept yelling, sarge?" he said, at last.

"Stinky," Kilgallen said. "When your image went in after him he started yelling for Stinky to come and help him."

"Are you sure it wasn't *In-Ki,* sarge?"

"Inky?"

"Sarge, in the monkey language *In* means—the negative principle. And *ki* means—an emanation. When you combine the two monosyllables you get *In-Ki*—negative emanation."

"Huh?"

"Don't you get it, sarge? Negative emanation—ghost. The Nip machine-gunner thought he saw a ghost. And if you've dipped into Lafcadio Hearn, sarge, you'll know there's nothing a Jap fears quite so much as a ghost. That's because most Japanese ghosts are faceless, and—"

Jimmy smiled grimly. "An image loses its face just before it coils up and explodes, sergeant."

Jimmy told himself—this was after the sergeant had left—that an ordinary image of himself couldn't have gone all out for victory. It would simply have drifted on with rigid limbs like a zombie.

But an image bearing a force-shell brain which was in all respects an exact duplicate of Jimmy Norse's brain would go right on thinking and acting like Jimmy Norse.

For thought was an electrical phenomenon, and the synaptic hookup in such a brain would be identical with the one in Jimmy Norse's own skull, right down to its corticipetal fibers.

You might even—Jimmy paled a little at the thought—think of such an image as a ghost in the electromagnetic field, a ghost which would carry on no matter what happened to its flesh-and-blood self.

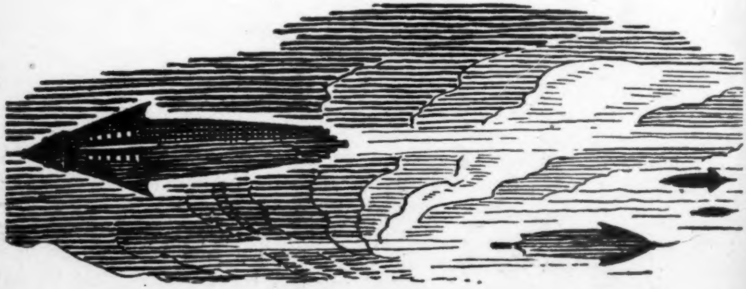
And how would it *feel,* carrying on? More or less brave than a Jimmy Norse who had stopped a slug, and gone down flat on his face?

Jimmy could only speculate. He could only speculate, too, about the projector, though he was nine tenths convinced it had sprouted—wild talents.

Leatherneck Norse had read somewhere that you didn't always need an elaborate apparatus to generate Rontgen rays of great penetrating power, and the projector was really complex, full of hollow spheres, and anodes and such, and a jolt might have done it—

X-rayed his skull, and projected a three-dimensional image of his brain neatly wrapped in a force-shell membrane to go with his force-shell body.

THE END.



Ogre

by Clifford D. Simak

***It's** always hard for one race to understand an utterly alien one. The Encyclopedia, for instance, got his knowledge from a robot—and missed one vital factor!*

Illustrated by Kramer

THE moss brought the news. Hundreds of miles the word had gossiped its way along, through many devious ways. For the moss did not grow everywhere. It grew only where the soil was sparse and niggardly, where the larger, lustier, more vicious plant things could not grow to rob it of light, or uproot it, or crowd it out, or do it other harm.

The moss told the story to Nicodemus, life blanket of Don Mackenzie, and it all came about because Mackenzie took a bath.

Mackenzie took his time in the bathroom, wallowing around in the tub and braying out a song, while Nicodemus, feeling only half a thing, moped outside the door. Without Mackenzie, Nicodemus was, in fact, even less than half a thing. Accepted as intelligent life, Nicodemus and others of his tribe were intelligent only when they were wrapped about their humans. Their intelligence and emotions were borrowed from the things that wore them.

For the æons before the human beings came to this twilight world, the life blankets had dragged out a humdrum existence. Occasionally one of them allied itself with a higher form of plant life, but not often. After all, such an arrangement was very little better than staying as they were.

When the humans came, however, the blankets finally clicked. Between them and the men of Earth grew up a perfect mutual agreement, a highly profitable and agreeable instance of symbiosis. Overnight, the blankets became one of the greatest single factors in galactic exploration.

For the man who wore one of them, like a cloak around his shoulders, need never worry where a meal was coming from; knew, furthermore, that he would be fed correctly, with a scientific precision that automatically counterbalanced any upset of metabolism that might be brought about by alien conditions. For the curious plants had the ability to gather energy and convert it into food for the human body, had an uncanny instinct as to the exact needs of the body, extending, to a limited extent, to certain basic medical requirements.

But if the life blankets gave men food and warmth, served as a family doctor, man lent them something that was even more precious—the consciousness of life. The moment one of the plants wrapped itself around a man it became, in a sense, the double of that man. It shared his intelligence and emotions, was whisked from the dreary round of its own existence into a more exalted pseudo-life.

Nicodemus, at first moping outside the bathroom door, gradually grew peeved. He felt his thin veneer of human life slowly ebbing from him and he was filled with a baffling resentment.

Finally, feeling very put upon, he waddled out of the trading post upon his own high lonesome, flapping awkwardly along, like a sheet billowing in the breeze.

The dull brick-red sun that was Sigma Draco shone down upon a world that even at high noon appeared to be in twilight and Nicodemus' bobbling shape cast squirming, unsubstantial purple shadows upon the green and crimson ground. A rifle tree took a shot at Nicodemus but missed him by a yard at least. That tree had been off the beam for weeks. It had missed everything it shot at. Its best effort had been scaring the life out of

Nellie, the bookkeeping robot that never told a lie, when it banked one of its bulletlike seeds against the steel-sheeted post.

But no one had felt very badly about that, for no one cared for Nellie. With Nellie around, no one could chisel a red cent off the company. That, incidentally, was the reason she was at the post.

But for a couple of weeks now, Nellie hadn't bothered anybody. She had taken to chumming around with Encyclopedia, who more than likely was slowly going insane trying to figure out her thoughts.

Nicodemus told the rifle tree what he thought of it, shooting at its own flesh and blood, as it were, and kept shuffling along. The tree, knowing Nicodemus for a traitor to his own, a vegetable renegade, took another shot at him, missed by two yards and gave up in disgust.

Since he had become associated with a human, Nicodemus hadn't had much to do with other denizens of the planet—even the Encyclopedia. But when he passed a bed of moss and heard it whispering and gossiping away, he tarried for a moment, figurative ear cocked to catch some juicy morsel.

That is how he heard that Alder, minor musician out in Melody Bowl, finally had achieved a masterpiece. Nicodemus knew it might have happened weeks before, for Melody Bowl was half a world away and the news sometimes had to travel the long way round, but just the same he scampered as fast as he could hump back toward the post.

For this was news that couldn't wait. This was news Mackenzie had to know at once. He managed to kick up quite a cloud of dust coming down the home stretch and flapped triumphantly through the door, above which hung the crudely lettered sign:

GALACTIC TRADING CO.

Just what good the sign did, no one yet had figured out. The humans were the only living things on the planet that could read it.

Before the bathroom door, Nicodemus reared up and beat his fluttering self against it with tempetuous urgency.

"All right," yelled Mackenzie. "All right. I know I took too long again. Just calm yourself. I'll be right out."

Nicodemus settled down, still wriggling with the news he had to tell, heard Mackenzie swabbing out the tub.

With Nicodemus wrapped happily about him, Mackenzie strode into the office and found Nelson Harper, the factor, with his feet up on the desk, smoking his pipe and studying the ceiling.

"Howdy, lad," said the factor. He pointed at a bottle with his pipestem. "Grab yourself a snort."

Mackenzie grabbed one.

"Nicodemus has been out chewing fat with the moss," he said. "Tells me a conductor by the name of Alder has composed a symphony. Moss says it's a masterpiece."

Harper took his feet off the desk. "Never heard of this chap, Alder," he said.

"Never heard of Kadmar, either," Mackenzie reminded him, "until he produced the Red Sun symphony. Now everyone is batty over him. If Alder has anything at all, we ought to get it down. Even a mediocre piece pays out. People back on Earth are plain wacky over this tree music of ours. Like that one fellow . . . that composer—"

"Wade," Harper filled in. "J. Edgerton Wade. One of the greatest composers Earth had ever known. Quit in mortification after he heard the Red Sun piece. Later disappeared. No one knows where he went."

The factor nursed his pipe between his palms. "Funny thing. Came out here figuring our best trading bet would be new drugs or maybe some new kind of food. Something for the high-class restaurants to feature, charge ten bucks a plate for. Maybe even a new mineral. Like out on Eta Cassiop. But it wasn't any of those things. It was music. Symphony stuff. High-brow racket."

Mackenzie took another shot at the bottle, put it back and wiped his mouth. "I'm not so sure I like this music angle," he declared. "I don't know much about music. But it sounds funny to me, what I've heard of it. Brain-twisting stuff."

Harper grunted. "You're O. K. as long as you have plenty of serum along. If you can't take the music, just keep yourself shot full of serum. That way it can't touch you."

Mackenzie nodded. "It almost got Alexander that time, remember? Ran short on serum while he was down in the Bowl trying to dicker with the trees. Music seemed to have a hold on him. He didn't want to leave. He fought and screeched and yelled around. . . . I felt like a heel, taking him away. He never has been quite the same since then. Doctors back on Earth finally were able to get him straightened out, but warned him never to come back."

"He's back again," said Harper, quietly.

"What's that?"

"Alexander's back again," said Harper. "Grant spotted him over at the Groombridge post. Throwing in with the Groomies, I guess. Just a yellow-bellied renegade. Going against his own race. You boys shouldn't have saved him that time. Should have let the music get him."

"What are you doing to do about it?" demanded Mackenzie.

Harper shrugged his shoulders. "What can I do about it? Unless I want to declare war on the Groombridge post. And that is out. Haven't you heard it's all sweetness and light between Earth and Groombridge 34? That's the reason the two posts are stuck away from Melody Bowl. So each one of us will have a fair shot at the music. All according to some pact the two companies rigged up. Galactic's got so pure they wouldn't even like it if they knew we had a spy planted on the Groomie post."

"But they got one planted on us," declared Mackenzie. "We haven't been able to find him, of course, but we know there is one. He's out there in the woods somewhere, watching every move we make."

Harper nodded his head. "You can't trust a Groomie. The lousy little insects will stoop to anything. They don't want that music, can't use it. Probably don't even know what music is. Haven't any hearing. But they know Earth wants it, will pay any price to get it, so they are out here to beat us to it. They work through birds like Alexander. They get the stuff, Alexander peddles it."

"What if we run across Alexander, chief?"

Harper clicked his pipestem across his teeth. "Depends on circumstances. Try to hire him, maybe. Get him away from the Groomies. He's a good trader. The company would do right by him."

Mackenzie shook his head. "No soap. He hates Galactic. Something that happened years ago. He'd rather make us trouble than turn a good deal for himself."

"Maybe he's changed," suggested Harper. "Maybe you boys saving him changed his mind."

"I don't think it did," persisted Mackenzie.

The factor reached across the desk and drew a humidor in front of him, began to refill his pipe.

"Been trying to study out something else, too," he said. "Wondering what to do with the Encyclopedia. He wants to go to Earth. Seems he's found out just enough from us to whet his appetite for knowledge. Says he wants to go to Earth and study our civilization."

Mackenzie grimaced. "That baby's gone through our minds with a fine-toothed comb. He knows some of the things we've forgotten we ever knew. I guess it's just the nature of him, but it gets my wind up when I think of it."

"He's after Nellie now," said Harper. "Trying to untangle what she knows."

"It would serve him right if he found out."

"I've been trying to figure it out," said Harper. "I don't like this brain-picking of his any more than you do, but if we took him to Earth, away from his own stamping grounds, we might be able to soften him up. He certainly knows a lot about this planet that would be of value to us. He's told me a little—"

"Don't fool yourself," said Mackenzie. "He hasn't told you a thing more than he's had to tell to make you believe it wasn't a one-way deal. Whatever he has told you has no vital significance. Don't kid yourself he'll exchange information for information. That cookie's out to get everything he can get for nothing."

The factor regarded Mackenzie narrowly. "I'm not sure but I should put you in for an Earth vacation," he declared. "You're letting things upset you. You're losing your perspective. Alien planets aren't Earth, you know. You have to expect wacky things, get along with them, accept them on the basis of the logic that makes them the way they are."

"I know all that," agreed Mackenzie, "but honest, chief, this place gets in my hair at times. Trees that shoot at you, moss that talks, vines that heave thunderbolts at you—and now, the Encyclopedia."

"The Encyclopedia is logical," insisted Harper. "He's a repository for knowledge. We have parallels on Earth. Men who study merely for the sake of learning, never expect to use the knowledge they amass. Derive a strange, smug satisfaction from being well informed. Combine that yearning for knowledge with a phenomenal ability to memorize and co-ordinate that knowledge and you have the Encyclopedia."

"But there must be a purpose to him," insisted Mackenzie. "There must be some reason back of this thirst for knowledge. Just soaking up facts doesn't add up to anything unless you use those facts."

Harper puffed stolidly at his pipe. "There may be a purpose in it, but a purpose so deep, so different, we could not recognize it. This planet is a vegetable world and a vegetable civilization. Back on Earth the animals got the head start and plants never had a chance to learn or to evolve. But here it's a different story. The plants were the ones that evolved, became masters of the situation."

"If there is a purpose, we should know it," Mackenzie declared, stubbornly. "We can't afford to go blind on a thing like this. If the Encyclopedia has a game, we should know it. Is he acting on his own, a free lance? Or is he the representative of the world, a sort of prime minister, a state department? Or is he something that was left over by another civilization, a civilization that is gone? A kind of living archive of knowledge, still working at his old trade even if the need of it is gone?"

"You worry too much," Harper told him.

"We have to worry, chief. We can't afford to let anything get ahead of us. We have taken the attitude we're superior to this vegetable civilization, if you can call it a civilization, that has developed here. It's the logical attitude to take because nettles and dandelions and trees aren't anything to be afraid of back home. But what holds on Earth, doesn't hold here. We have to ask ourselves what a vegetable civilization would be like. What would it want? What would be its aspirations and how would it go about realizing them?"

"We're getting off the subject," said Harper, curtly. "You came in here to tell me about some new symphony."

Mackenzie flipped his hands. "O. K. if that's the way you feel about it."

"Maybe we better figure on grabbing up this symphony soon as we can," said Harper. "We haven't had a really good one since the Red Sun. And if we mess around, the Groomies will beat us to it."

"Maybe they have already," said Mackenzie.

Harper puffed complacently at his pipe. "They haven't done it yet. Grant keeps me posted on every move they make. He doesn't miss a thing that happens at the Groombridge post."

"Just the same," declared Mackenzie, "we can't go rushing off and tip our hand. The Groomie spy isn't asleep, either."

"Got any ideas?" asked the factor.

"We could take the ground car," suggested Mackenzie. "It's slower than the flier, but if we took the flier the Groomie would know there was something up. We use the car a dozen times a day. He'd think nothing of it."

Harper considered. "The idea has merit, lad. Who would you take?"

"Let me have Brad Smith," said Mackenzie. "We'll get along all right, just the two of us. He's an old-timer out here. Knows his way around."

Harper nodded. "Better take Nellie, too."

"Not on your life!" yelped Mackenzie. "What do you want to do? Get rid of her so you can make a cleaning?"

Harper wagged his grizzled head sadly. "Good idea, but it can't be did. One cent off and she's on your trail. Use to be a little graft fellow could pick up here and there, but not any more. Not since they got these robot bookkeepers indoctrinated with truth and honesty."

"I won't take her," Mackenzie declared, flatly. "So help me, I won't. She'll spout company law all the way there and back. With the crush she has on this Encyclopedia, she'll probably want to drag him along, too. We'll have trouble enough with rifle trees and electro vines and all the other crazy vegetables without having an educated cabbage and a tin-can lawyer underfoot."

"You've got to take her," insisted Harper, mildly. "New ruling. Got to have one of the things along on every deal you make to prove you did right by the natives. Come right down to it, the ruling probably is your own fault. If you hadn't been so foxy on that Red Sun deal, the company never would have thought of it."

"All I did was to save the company some money," protested Mackenzie.

"You knew," Harper reminded him crisply, "that the standard price for a symphony is two bushels of fertilizer. Why did you have to chisel half a bushel on Kadmar?"

"Cripes," said Mackenzie, "Kadmar didn't know the difference. He practically kissed me for a bushel and a half."

"That's not the point," declared Harper. "The company's got the idea we got to shoot square with everything we trade with, even if it's nothing but a tree."

"I know," said Mackenzie, dryly. "I've read the manual."

"Just the same," said Harper, "Nellie goes along."

He studied Mackenzie over the bowl of his pipe.

"Just to be sure you don't forget again," he said.

The man who back on Earth had been known as J. Edgerton Wade, crouched on the low cliff that dropped away into Melody Bowl. The dull red sun was slipping toward the purple horizon and soon, Wade knew, the trees would play their regular evening concert. He hoped that once again it would be the wondrous new symphony Alder had composed. Thinking about it, he shuddered in ecstacy—shuddered again when he thought about the setting sun. The evening chill would be coming soon.

Wade had no life blanket. His food, cached back in the tiny cave in the cliff, was nearly gone. His ship, smashed in his inexpert landing on the planet almost a year before, was a rusty hulk. J. Edgerton Wade was near the end of his rope —and knew it. Strangely, he didn't care. In that year since he'd come here to the cliffs, he'd lived in a world of beauty. Evening after evening he had listened to the concerts. That was enough, he told himself. After a year of music such as that any man could afford to die.

He swept his eyes up and down the little valley that made up the bowl, saw the trees set in orderly rows, almost as if someone had planted them. Some intelligence that may at one time, long ago, have squatted on this very cliff edge, even as he squatted now, and listened to the music.

But there was no evidence, he knew, to support such a hypothesis. No ruins of cities had been found upon this world. No evidence that any civilization, in the sense that Earth had built a civilization, ever had existed here. Nothing at all that suggested a civilized race had ever laid eyes upon this valley, had ever had a thing to do with the planning of the bowl.

Nothing, that was, except the cryptic messages on the face of the cliff above the cave where he cached his food and slept. Scrawlings that bore no resemblance to any other writing Wade had ever seen. Perhaps, he speculated, they might have been made by other aliens who, like himself, had come to listen to the music until death had come for them.

Still crouching, Wade rocked slowly on the balls of his feet. Perhaps he should scrawl his own name there with the other scrawlings. Like one would sign a hotel register. A lonely name scratched upon the face of a lonely rock. A grave name, a brief memorial—and yet it would be the only tombstone he would ever have.

The music would be starting soon and then he would forget about the cave, about the food that was almost gone, about the rusting ship that never could carry him back to Earth again—even had he wanted to go back. And he didn't—he couldn't have gone back. The Bowl had trapped him, the music had spun a web about him. Without it, he knew, he could not live. It had become a part of him. Take it from him and he would be a shell, for it was now a part of the life force that surged within his body, part of his brain and blood, a silvery thread of meaning that ran through his thoughts and purpose.

The trees stood in quiet, orderly ranks and beside each tree was a tiny mound, podia for the conductors, and beside each mound the dark mouths of burrows. The conductors, Wade knew, were in those burrows, resting for the concert. Being animals, the conductors had to get their rest.

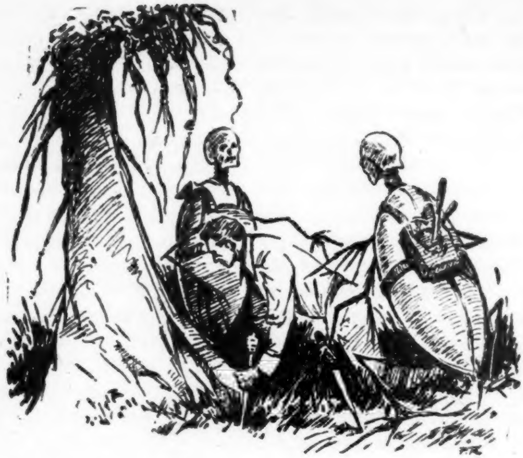
But the trees never needed rest. They never slept. They never tired, these gray, drab music trees, the trees that sang to the empty sky, sang of forgotten days and days that had not come, of days when Sigma Draco had been a mighty sun and of the later days when it would be a cinder circling in space. And of other things an Earthman could never know, could only sense and strain toward and wish he knew. Things that stirred strange thoughts within one's brain and choked one with alien emotion an Earthman was never meant to feel. Emotion and thought that one could not even recognize, yet emotion and thought that one yearned toward and knew never could be caught.

Technically, of course, it wasn't the trees that sang. Wade knew that, but he did not think about it often. He would rather it had been the trees alone. He seldom thought of the music other than belonging to the trees, disregarded the little entities inside the trees that really made the music, using the trees for their sounding boards. Entities? That was all he knew. All anybody knew. Insects, perhaps, a colony of insects to each tree—or maybe even nymphs or sprites or some of the other little folks that run on skipping feet through the pages of children's fairy books. Although that was foolish, he told himself—there were no sprites.

Each insect, each sprite contributing its own small part to the orchestration, compliant to the thought-vibrations of the conductors. The conductors thought the music, held it in their brains and the things in the trees responded.

It didn't sound so pretty that way, Wade told himself. Thinking it out spoiled the beauty of it. Better to simply accept it and enjoy it without explanation.

Men came at times—not often—men of his own flesh and blood, men from the trading post somewhere on the planet. They came to record the music and then they went away. How anyone could go away once they had heard the music, Wade could not understand. Faintly he remembered there was a way one



could immunize one's self against the music's spell, condition one's self so he could leave after he had heard it, dull his senses to a point where it could not hold him. Wade shivered at the thought. That was sacrilege. But still no worse than recording the music so Earth orchestras might play it. For what Earth orchestra could play it as he heard it here, evening after evening? If Earth music lovers only could hear it as it was played here in this ancient bowl!

When the Earthmen came, Wade always hid. It would be just like them to try to take him back with them, away from the music of the trees.

Faintly the evening breeze brought the foreign sound to him, the sound that should not have been heard there in the Bowl—the clank of steel on stone.

Rising from his squatting place, he tried to locate the origin of the sound. It came again, from the far edge of the Bowl. He shielded his eyes with a hand against the setting sun, stared across the Bowl at the moving figures.

There were three of them and one, he saw at once, was an Earthman. The other two were strange creatures that looked remotely like monster bugs, chitinous armor glinting in the last rays of Sigma Draco. Their heads, he saw, resembled grinning skulls and they wore dark harness, apparently for the carrying of tools or weapons.

Groombridgians! But what would Groombridgians be doing with an Earthman? The two were deadly trade rivals, were not above waging intermittent warfare when their interests collided.

Something flashed in the sun—a

gleaming tool that stabbed and probed, stabbed and lifted.

J. Edgerton Wade froze in horror.

Such a thing, he told himself, simply couldn't happen!

The three across the bowl were digging up a music tree!

The vine sneaked through the rustling sea of grass, cautious tendrils raised to keep tab on its prey, the queer, clanking thing that still rolled on unswervingly. Came on without stopping to smell out the ground ahead, without zigzagging to throw off possible attack.

Its action was puzzling; that was no way for anything to travel on this planet. For a moment a sense of doubt trilled along the length of vine, doubt of the wisdom of attacking anything that seemed so sure. But the doubt was short lived, driven out by the slavering anticipation that had sent the vicious vegetable from its lair among the grove of rifle trees. The vine trembled a little—slightly drunk with the vibration that pulsed through its tendrils.

The queer thing rumbled on and the vine tensed itself, every fiber alert for struggle. Just let it get so much as one slight grip upon the thing—

The prey came closer and for one sense-shattering moment it seemed it would be out of reach. Then it lurched slightly to one side as it struck a hump in the ground and the vine's tip reached out and grasped, secured a hold, wound itself in a maddened grip and hauled, hauled with all the might of almost a quarter mile of trailing power.

Inside the ground car, Don Mackenzie felt the machine lurch sickeningly, kicked up the power and spun the tractor on its churning treads in an effort to break loose.

Back of him Bradford Smith uttered a startled whoop and dived for an energy gun that had broken from its rack and was skidding across the floor. Nellie, upset by the lurch, was flat on her back, jammed into a corner. The Encyclopedia, at the moment of shock, had whipped out its coiled up taproot and tied up to a pipe. Now, like an anchored turtle, it swayed pendulum-wise across the floor.

Glass tinkled and metal screeched on metal as Nellie thrashed to regain her feet. The ground car reared and seemed to paw the air, slid about and plowed great furrows in the ground.

"It's a vine!" shrieked Smith.

Mackenzie nodded, grim-lipped, fighting the wheel. As the car slewed around, he saw the arcing loops of the attacker, reaching from the grove of rifle trees. Something pinged against the vision plate, shattered into a puff of dust. The rifle trees were limbering up.

Mackenzie tramped on the power, swung the car in a wide circle, giving the vine some slack, then quartered and charged across the prairie while the vine twisted and flailed the air in looping madness. If only he could build up speed, slap into the stretched-out vine full tilt, Mackenzie was sure he could break its hold. In a straight pull, escape would have been hopeless, for the vine, once it fastened on a thing, was no less than a steel cable of strength and determination.

Smith had managed to get a port open, was trying to shoot, the energy gun crackling weirdly. The car rocked from side to side, gaining speed while bulletlike seeds from the rifle trees pinged and whined against it.

Mackenzie braced himself and yelled at Smith. They must be nearing the end of their run. Any minute now would come the jolt as they rammed into the tension of the outstretched vine.

It came with terrifying suddenness, a rending thud. Instinctively, Mackenzie threw up his arms to protect himself, for one startled moment knew he was being hurled into the vision plate. A gigantic burst of flame flared in his head and filled the universe. Then he was floating through darkness that was cool and soft and he found himself thinking that everything would be all right, everything would be . . . everything—

But everything wasn't all right. He knew that the moment he opened his eyes and stared up into the mass of tangled wreckage that hung above him. For many seconds he did not move, did not even wonder where he was. Then he stirred and a piece of steel bit into his leg. Carefully he slid his leg upward, clearing it of the steel. Cloth ripped with an angry snarl, but his leg came free.

"Lie still, you lug," something said, almost as if it were a voice from inside of him.

Mackenzie chuckled. "So you're all right," he said.

"Sure. I'm all right," said Nicodemus. "But you got some bruises and a scratch or two and you're liable to have a headache if you—"

The voice trailed off and stopped. Nicodemus was busy. At the moment, he was the medicine cabinet, fashioning from pure energy those things that a man needed when he had a bruise or two and was scratched up some and might have a headache later.

Mackenzie lay on his back and stared up at the mass of tangled wreckage.

"Wonder how we'll get out of here," he said.

The wreckage above him stirred. A gadget of some sort fell away from the twisted mass and gashed his cheek. He swore—unenthusiastically.

Someone was calling his name and he answered.

The wreckage was jerked about violently, literally torn apart. Long metal arms reached down, gripped him by the shoulders and yanked him out, none too gently.

"Thanks, Nellie," he said.

"Shut up," said Nellie, tartly.

His knees were a bit wabbly and he sat down, staring at the ground car. It didn't look much like a ground car any more. It had smashed full tilt into a boulder and it was a mess.

To his left Smith also was sitting on the ground and he was chuckling.

"What's the matter with you," snapped Mackenzie.

"Jerked her right up by the roots," exulted Smith. "So help me, right smack out of the ground. That's one vine that'll never bother anyone again."

Mackenzie stared in amazement. The vine lay coiled on the ground, stretching back toward the grove, limp and dead. Its smaller tendrils still were entwined in the tangled wreckage of the car.

"It hung on," gasped Mackenzie. "We didn't break its hold!"

"Nope," agreed Smith, "we didn't break its hold, but we sure ruined it."

"Lucky thing it wasn't an electro," said Mackenzie, "or it would have fried us."

Smith nodded glumly. "As it is it's loused us up enough. That car will never run again. And us a couple thousand miles from home."

Nellie emerged from a hole in the wreckage, with the Encyclopedia under one arm and a mangled radio under the other. She dumped them both on the ground. The Encyclopedia scuttled off a few feet, drilled his taproot into the soil and was at home.

Nellie glowered at Mackenzie. "I'll report you for this," she declared, vengefully. "The idea of breaking up a nice new car! Do you know what a car costs the company. No, of course, you don't. And you don't care. Just go ahead and break it up. Just like that. Nothing to it. The company's got a lot more money to buy another one. I wonder sometimes if you ever wonder where your pay is coming from. If I was the company, I'd take it out of your salary. Every cent of it, until it was paid for."

Smith eyed Nellie speculatively. "Some day," he said, "I'm going to take a sledge and play tin shinny with you."

"Maybe you got something there," agreed Mackenzie. "There are times when I'm inclined to think the company went just a bit too far in making those robots cost conscious."

"You don't need to talk like that," shrilled Nellie. "Like I was just a machine you didn't need to pay no attention to. I suppose next thing you will be saying it wasn't your fault, that you couldn't help it."

"I kept a good quarter mile from all the groves," growled Mackenzie. "Who ever heard of a vine that could stretch that far?"

"And that ain't all, neither," yelped Nellie. "Smith hit some of the rifle trees."

The two men looked toward the grove. What Nellie said was true. Pale wisps of smoke still rose above the grove and what trees were left looked the worse for wear.

Smith clucked his tongue in mock concern.

"The trees were shooting at us," retorted Mackenzie.

"That don't make any difference," Nellie yelled. "The rule book says—"

Mackenzie waved her into silence. "Yes, I know. Section 17 of the chapter on Relations with Extraterrestrial Life: *'No employee of this company may employ weapons against or otherwise injure or attempt to injure or threaten with injury any inhabitant of any other planet except in self-defense and then only if every means of escape or settlement has failed.'* "

"And now we got to go back to the post," Nellie shrieked. "When we were almost there, we got to turn back. News of what we did will get around. The moss probably has started it already. The idea of ripping a vine up by the roots and shooting trees. If we don't start back right now, we won't get back. Every living thing along the way will be laying for us."

"It was the vine's fault," yelled Smith. "It tried to trap us. It tried to steal our car, probably would have killed us, just for the few lousy ounces of radium we have in the motors. That radium was ours. Not the vine's. It belonged to your beloved company."

"For the love of gosh, don't tell her that," Mackenzie warned, "or she'll go out on a one robot expedition, yanking vines up left and right."

"Good idea," insisted Smith. "She might tie into an electro. It would peel her paint."

"How about the radio?" Mackenzie asked Nellie.

"Busted," said Nellie, crustily.

"And the recording equipment?"

"The tape's all right and I can fix the recorder."

"Serum jugs busted?"

"One of them ain't," said Nellie.

"O. K., then," said Mackenzie, "get back in there and dig out two bags of fertilizer. We're going on. Melody Bowl is only about fifty miles away."

"We can't do that," protested Nellie. "Every tree will be waiting for us, every vine—"

"It's safer to go ahead than back," said Mackenzie. "Even if we have no radio, Harper will send someone out with the flier to look us up when we are overdue."

He rose slowly and unholstered his pistol.

"Get in there and get that stuff," he ordered. "If you don't, I'll melt you down into a puddle."

"All right," screamed Nellie, in sudden terror. "All right. You needn't get so tough about it."

"Any more back talk out of you," Mackenzie warned, "and I'll kick you so full of dents you'll walk stooped over."

They stayed in the open, well away from the groves, keeping a close watch. Mackenzie went ahead and behind him came the Encyclopedia, humping along to keep pace with them. Back of the Encyclopedia was Nellie, loaded down with the bags of fertilizer and equipment. Smith brought up the rear.

A rifle tree took a shot at them, but the range was too far for accurate shooting. Back a way, an electro vine had come closer with a thunderbolt.

Walking was grueling. The grass was thick and matted and one had to plow through it, as if one were walking in water.

"I'll make you sorry for this," seethed Nellie. "I'll make—"

"Shut up," snapped Smith. "For once you're doing a robot's work instead of gumshoeing around to see if you can't catch a nickel out of place."

They breasted a hill and started to climb the long grassy slope.

Suddenly a sound like the savage ripping of a piece of cloth struck across the silence.

They halted, tensed, listening. The sound came again and then again.

"Guns!" yelped Smith.

Swiftly the two men loped up the slope, Nellie galloping awkwardly behind, the bags of fertilizer bouncing on her shoulders.

From the hilltop, Mackenzie took in the situation at a glance.

On the hillside below a man was huddled behind a boulder, working a gun with fumbling desperation, while farther down the hill a ground car had toppled over. Behind the car were three figures—one man and two insect creatures.

"Groomies!" whooped Smith.

A well-directed shot from the car took the top off the boulder and the man behind it hugged the ground.

Smith was racing quarteringly down the hill, heading toward another boulder that would outflank the trio at the car.

A yell of human rage came from the car and a bolt from one of the three guns snapped at Smith, plowing a smoking furrow no more than ten feet behind him.

Another shot flared toward Mackenzie and he plunged behind a hummock. A second shot whizzed just above his head and he hunkered down trying to push himself into the ground.

From the slope below came the high-pitched, angry chittering of the Groombridgians.

The car, Mackenzie, saw, was not the only vehicle on the hillside. Apparently it had been pulling a trailer to which was lashed a tree. Mackenzie squinted against the setting sun, trying to make out what it was all about. The tree, he saw, had been expertly dug, its roots balled in earth and wrapped in sacking that shone wetly. The trailer was canted at an awkward angle, the treetop sweeping the ground, the balled roots high in the air.

Smith was pouring a deadly fire into the hostile camp and the three below were replying with a sheet of blasting bolts, plowing up the soil around the boulder. In a minute or two, Mackenzie knew, they would literally cut the ground out from under Smith. Cursing under his breath, he edged around the hummock, pushing his pistol before him, wishing he had a rifle.

The third man was slinging an occasional, inexpert shot at the three below, but wasn't doing much to help the cause along. The battle, Mackenzie knew, was up to him and Smith.

He wondered abstractedly where Nellie was.

"Probably halfway back to the post by now," he told himself, drawing a bead on the point from which came the most devastating blaze of firing.

But even as he depressed the firing button, the firing from below broke off in a chorus of sudden screams. The two Groombridgians leaped up and started to run, but before they made their second stride, something came whizzing through the air from the slope below and crumpled one of them.

The other hesitated, like a startled hare, uncertain where to go, and a second thing came whishing up from the bottom of the slope and smacked against his breastplate with a thud that could be heard from where Mackenzie lay.

Then, for the first time Mackenzie saw Nellie. She was striding up the hill, her left arm holding an armful of stones hugged tight against her metal chest, her right arm working like a piston. The ringing clang of stone against metal came as one of the stones missed its mark and struck the ground car.

The human was running wildly, twisting and ducking, while Nellie pegged rock after rock at him. Trying to get set for a shot at her, the barrage of whizzing stones kept him on the dodge. Angling down the hill, he finally lost his rifle when he tripped and fell. With a howl of terror, he bolted up the hillside, his life blanket standing out almost straight behind him. Nellie pegged her last stone at him, then set out, doggedly loping in his wake.

Mackenzie screamed hoarsely at her, but she did not stop. She passed out of sight over the hill, closely behind the fleeing man.

Smith whooped with delight. "Look at our Nellie go for him," he yelled. "She'll give him a working over when she nails him."

Mackenzie rubbed his eyes. "Who was he?" he asked.

"Jack Alexander," said Smith. "Grant said he was around again."

The third man got up stiffly from behind his boulder and advanced toward them. He wore no life blanket, his clothing was in tatters, his face was bearded to the eyes.

He jerked a thumb toward the hill over which Nellie had disappeared. "A masterly military maneuver," he declared. "Your robot sneaked around and took them from behind."

"If she lost that recording stuff and the fertilizer, I'll melt her down," said Mackenzie, savagely.

The man stared at them. "You are the gentlemen from the trading post?" he asked.

They nodded, returning his stare.

"I am Wade," he said. "J. Edgerton Wade—"

"Wait a second," shouted Smith. "Not *the* J. Edgerton Wade? The lost composer?"

The man bowed, whiskers and all. "The same," he said. "Although I had not been aware that

I was lost. I merely came out here to spend a year, a year of music such as man has never heard before."

He glared at them. "I am a man of peace," he declared, almost as if daring them to argue that he wasn't, "but when those three dug up Delbert, I knew what I must do."

"Delbert?" asked Mackenzie.

"The tree," said Wade. "One of the music trees."

"Those lousy planet-runners," said Smith, "figured they'd take that tree and sell it to someone back on Earth. I can think of a lot of big shots who'd pay plenty to have one of those trees in their back yard."

"It's a lucky thing we came along," said Mackenzie, soberly. "If we hadn't, if they'd got away with it, the whole planet would have gone on the warpath. We could have closed up shop. It might have been years before we dared come back again."

Smith rubbed his hands together, smirking. "We'll take back their precious tree," he declared, "and will that put us in solid! They'll give us their tunes from now on, free for nothing, just out of pure gratitude."

"You gentlemen," said Wade, "are motivated by mercenary factors but you have the right idea."

A heavy tread sounded behind them and when they turned they saw Nellie striding down the hill. She clutched a life blanket in her hand.

"He got away," she said, "but I got his blanket. Now I got a blanket, too, just like you fellows."

"What do you need with a life blanket?" yelled Smith. "You give that blanket to Mr. Wade. Right away. You hear me."

Nellie pouted. "You won't let me have anything. You never act like I'm human—"

"You aren't," said Smith.

"If you give that blanket to Mr. Wade," wheedled Mackenzie, "I'll let you drive the car."

"You would?" asked Nellie, eagerly.

"Really," said Wade, shifting from one foot to the other, embarrassed.

"You take that blanket," said Mackenzie. "You need it. Looks like you haven't eaten for a day or two."

"I haven't," Wade confessed.

"Shuck into it then and get yourself a meal," said Smith.

Nellie handed it over.

"How come you were so good pegging those rocks?" asked Smith.

Nellie's eyes gleamed with pride. "Back on Earth I was on a baseball team," she said. "I was the pitcher.

Alexander's car was undamaged except for a few dents and a smashed vision plate where Wade's first bolt had caught it, blasting the glass and startling the operator so that he swerved sharply, spinning the treads across a boulder and upsetting it.

The music tree was unharmed, its roots still well moistened in the burlap-wrapped, water-soaked ball of earth. Inside the tractor, curled in a tight ball in the darkest corner, unperturbed by the uproar that had been going on outside, they found Delbert, the two-foot high, roly-poly conductor that resembled nothing more than a poodle dog walking on its hind legs.

The Groombridgians were dead, their crushed chitinous armor proving the steam behind Nellie's delivery.

Smith and Wade were inside the tractor, settled down for the night. Nellie and the Encyclopedia were out in the night, hunting for the gun Alexander had dropped when he fled. Mackenzie, sitting on the ground, Nicodemus pulled snugly about him, leaned back against the car and smoked a last pipe before turning in.

The grass behind the tractor rustled.

"That you, Nellie?" Mackenzie called, softly.

Nellie clumped hesitantly around the corner of the car.

"You ain't sore at me?" she asked.

"No, I'm not sore at you. You can't help the way you are."

"I didn't find the gun," said Nellie.

"You knew where Alexander dropped it?"

"Yes," said Nellie. "It wasn't there."

Mackenzie frowned in the darkness. "That means Alexander managed to come back and get it. I don't like that. He'll be out gunning for us. He didn't like the company before. He'll really be out for blood after what we did today."

He looked around. "Where's the Encyclopedia?"

"I sneaked away from him. I wanted to talk to you about him."

"O. K., said Mackenzie. "Fire away."

"He's been trying to read my brain," said Nellie.

"I know. He read the rest of ours. Did a good job of it."

"He's been having trouble," declared Nellie.

"Trouble reading your brain? I wouldn't doubt it."

"You don't need to talk as if my brain—" Nellie began, but Mackenzie stopped her.

"I don't mean it that way, Nellie. Your brain is all right, far as I know. Maybe even better than ours. But the point is that it's different. Ours are natural brains, the orthodox way for things to think and reason and remember. The Encyclopedia knows about those kind of brains and the minds that go with them. Yours isn't that kind. It's artificial. Part mechanical, part chemical, part electrical, Lord knows what else; I'm not a robot technician. He's never run up against that kind of brain before. It probably has him down. Matter of fact, our civilization probably has him down. If this planet ever had a real civilization, it wasn't a mechanical one. There's no sign of mechanization here. None of the scars machines inflict on planets."

"I been fooling him," said Nellie quietly. "He's been trying to read my mind, but I been reading his."

Mackenzie started forward. "Well, I'll be—" he began. Then he settled back against the car, dead pipe hanging from between his teeth. "Why didn't you ever let us know you could read minds?" he demanded. "I suppose you been sneaking around all this time, reading our minds, making fun of us, laughing behind our backs."

"Honest, I ain't," said Nellie. "Cross my heart, I ain't. I didn't even know I could. But, when I felt the Encyclopedia prying around inside my head the way he does, it kind of got my dander up. I almost hauled off and smacked him one. And then I figured maybe I better be more subtle. I figured that if he could pry around in my mind, I could pry around in his. I tried it and it worked."

"Just like that," said Mackenzie.

"It wasn't hard," said Nellie. "It come natural. I seemed to just know how to do it."

"If the guy that made you knew what he'd let slip through his fingers, he'd cut his throat," Mackenzie told her.

Nellie sidled closer. "It scares me," she said.

"What's scaring you now?"

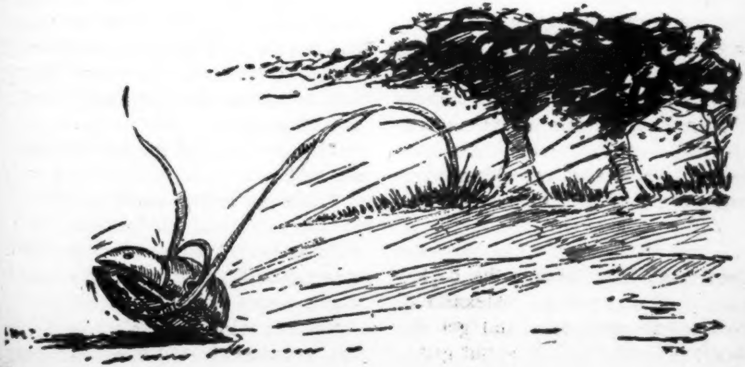
"That Encyclopedia knows too much."

"Alien stuff," said Mackenzie. "You should have expected that. Don't go messing around with an alien mentality unless you're ready for some shocks."

"It ain't that," said Nellie. "I knew I'd find alien stuff. But he knows other things. Things he shouldn't know."

"About us?"

"No, about other places. Places other than the Earth and this planet here. Places Earthmen ain't been to yet. The kind of things no Earthman could know by himself or



that no Encyclopedia could know by himself, either."

"Like what?"

"Like knowing mathematical equations that don't sound like anything we know about," said Nellie. "Nor like he'd know about if he'd stayed here all his life. Equations you couldn't know unless you knew a lot more about space and time than even Earthmen know."

"Philosophy, too. Ideas that make sense in a funny sort of way, but make your head swim when you try to figure out the kind of people that would develop them."

Mackenzie got out his pouch and refilled his pipe, got it going.

"Nellie, you think maybe this Encyclopedia has been at other minds? Minds of other people who may have come here?"

"Could be," agreed Nellie. "Maybe a long time ago. He's awful old. Lets on he could be immortal if he wanted to be. Said he wouldn't die until there was nothing more in the universe to know. Said when that time came there'd be nothing more to live for."

Mackenzie clicked his pipestem against his teeth. "He could be, too," he said. "Immortal, I mean. Plants haven't got all the physiological complications animals have. Given any sort of care, they theoretically could live forever."

Grass rustled on the hillside above them and Mackenzie settled back against the car, kept on smoking. Nellie hunkered down a few feet away.

The Encyclopedia waddled down the hill, starlight glinting from his shell-like back. Ponderously he lined up with them beside the car, pushing his taproot into the ground for an evening snack.

"Understand you may be going back to Earth with us," said Mackenzie, conversationally.

The answer came, measured in sharp and concise thought that seemed to drill deep into Mackenzie's mind. "I should like to. Your race is interesting."

It was hard to talk to a thing like that, Mackenzie told himself. Hard to keep the chatter casual when you knew all the time it was hunting around in the corners of your mind. Hard to match one's voice against the brittle thought with which it talked.

"What do you think of us?" he asked and knew, as soon as he had asked it, that it was asinine.

"I know very little of you," the Encyclopedia declared. "You have created artificial lives, while we on this planet have lived natural lives. You have bent every force that you can master to your will. You have made things work for you. First impression is that, potentially, you are dangerous."

"I guess I asked for it," Mackenzie said.

"I do not follow you."

"Skip it," said Mackenzie.

"The only trouble," said the Encyclopedia, "is that you don't know where you're going."

"That's what makes it so much fun," Mackenzie told him. "Cripes, if we knew where we were going, there'd be no adventure. We'd know what was coming next. As it is, every corner that we turn brings a new surprise."

"Knowing where you're going has its advantages," insisted the Encyclopedia.

Mackenzie knocked the pipe bowl out on his boot heel, tramped on the glowing ash.

"So you have us pegged," he said.

"No," said the Encyclopedia. "Just first impressions."

The music trees were twisted gray ghosts in the murky dawn. The conductors, except for the few who refused to let even a visit from the Earthmen rouse them from their daylight slumber, squatted like black imps on their podia.

Delbert rode on Smith's shoulder, one clawlike hand entwined in Smith's hair to keep from falling off. The Encyclopedia waddled along in the wake of the Earthman party. Wade led the way toward Alder's podium.

The Bowl buzzed with the hum of distorted thought, the thought of many little folk squatting on their mounds—an alien thing that made Mackenzie's neck hairs bristle just a little as it beat into his mind. There were no really separate thoughts, no one commanding thought, just the chitter-chatter of hundreds of little thoughts, as if the conductors might be gossiping.

The yellow cliffs stood like a sentinel wall and above the path that led to the escarpment, the tractor loomed like a straddled beetle against the early dawn.

Alder rose from the podium to greet them, a disreputable-looking gnome on gnarly legs.

The Earth delegation squatted on the ground. Delbert, from his perch on Smith's shoulder, made a face at Alder.

Silence held for a moment and then Mackenzie, dispensing with formalities, spoke to Alder. "We rescued Delbert for you," he told the gnome. "We brought him back."

Alder scowled and his thoughts were fuzzy with disgust. "We do not want him back," he said.

Mackenzie, taken aback, stammered. "Why, we thought . . . that is, he's one of you . . . we went to a lot of trouble to rescue him—"

"He's a nuisance," declared Alder. "He's a disgrace. He's a no-good. He's always trying things."

"You're not so hot yourself," piped Delbert's thought. "Just a bunch of fuddy-duddies. A crowd of corn peddlers. You're sore at me because I want to be different. Because I dust it off—"

"You see," said Alder to Mackenzie, "what he is like."

"Why, yes," agreed Mackenzie, "but there are times when new ideas have some values. Perhaps he may be—"

Alder leveled an accusing finger at Wade. "He was all right until you took to hanging around," he screamed. "Then he picked up some of your ideas. You contaminated him. Your silly notions about music—" Alder's thoughts gulped in sheer exasperation, then took up again. "Why did you come? No one asked you to? Why don't you mind your own business?"

Wade, red faced behind his beard, seemed close to apoplexy.

"I've never been so insulted in all my life," he howled. He thumped his chest with a doubled fist. "Back on Earth I wrote great symphonies myself. I never held with frivolous music. I never—"

"Crawl back into your hole," Delbert shrilled at Alder. "You guys don't know what music is. You saw out the same stuff day after day. You never lay it in the groove. You never get gated up. You all got long underwear."

Alder waved knotted fists above his head and hopped up and down in rage. "Such language!" he shrieked. "Never was the like heard here before."

The whole Bowl was yammering. Yammering with clashing thoughts of rage and insult.

"Now, wait," Mackenzie shouted. "All of you, quiet down!"

Wade puffed out his breath, turned a shade less purple. Alder squatted back on his haunches, unknotted his fists, tried his best to look composed. The clangor of thought subsided to a murmur.

"You're sure about this?" Mackenzie asked Alder. "Sure you don't want Delbert back."

"Mister," said Alder, "there never was a happier day in Melody Bowl than the day we found him gone."

A rising murmur of assent from the other conductors underscored his words.

"We have some others we'd like to get rid of, too," said Alder.

From far off across the Bowl came a yelping thought of derision.

"You see," said Alder, looking owlishly at Mackenzie, "what it is like. What we have to contend with. All because this . . . this . . . this—"

Glaring at Wade, thoughts failed him. Carefully he settled back upon his haunches, composed his face again.

"If the rest were gone," he said, "we could settle down. But as it is, these few keep us in an uproar all the time. We can't concentrate, we can't really work. We can't do the things we want to do."

Mackenzie pushed back his hat and scratched his head.

"Alder," he declared, "you sure are in a mess."

"I was hoping," Alder said, "that you might be able to take them off our hands."

"Take them off your hands!" yelled Smith. "I'll say we'll take them! We'll take as many—"

Mackenzie nudged Smith in the ribs with his elbow, viciously. Smith gulped into silence. Mackenzie tried to keep his face straight.

"You can't take them trees," said Nellie, icily. "It's against the law."

Mackenzie gasped. "The law?"

"Sure, the regulations. The company's got regulations. Or don't you know that? Never bothered to read them, probably. Just like you. Never pay no attention to the things you should."

"Nellie," said Smith savagely, "you keep out of this. I guess if we want to do a little favor for Alder here—"

"But it's against the law!" screeched Nellie.

"I know," said Mackenzie. "Section 34 of the chapter on Relations with Extraterrestrial Life. *'No member of this company shall interfere in any phase of the internal affairs of another race.'*"

"That's it," said Nellie, pleased with herself. "And if you take some of these trees, you'll be meddling in a quarrel that you have no business having anything to do with."

Mackenzie flipped his hands. "You see," he said to Alder.

"We'll give you a monopoly on our music," tempted Alder. "We'll let you know when we have anything. We won't let the Groomies have it and we'll keep our prices right."

Nellie shook her head. "No," she said.

Alder bargained. "Bushel and a half instead of two bushel."

"No," said Nellie.

"It's a deal," declared Mackenzie. "Just point out your duds and we'll haul them away."

"But Nellie said no," Alder pointed out. "And you say yes. I don't understand."

"We'll take care of Nellie," Smith told him, soberly.

"You won't take them trees," said Nellie. "I won't let you take them. I'll see to that."

"Don't pay any attention to her," Mackenzie said. "Just point out the ones you want to get rid of."

Alder said primly: "You've made us very happy."

Mackenzie got up and looked around. "Where's the Encyclopedia?" he asked.

"He cleared out a minute ago," said Smith. "Headed back for the car."

Mackenzie saw him, scuttling swiftly up the path toward the cliff top.

It was topsy-turvy and utterly crazy, like something out of that old book for children written by a man named Carroll. There was no sense to it. It was like taking candy from a baby.

Walking up the cliff path back to the tractor, Mackenzie knew it was, felt that he should pinch himself to know it was no dream.

He had hoped—just hoped—to avert relentless, merciless war against Earthmen throughout the planet by bringing back the stolen music tree. And here he was, with other music trees for his own, and a bargain thrown in to boot.

There was something wrong, Mackenzie told himself, something utterly and nonsensically wrong. But he couldn't put his finger on it.

There was no need to worry, he told himself. The thing to do was to get those trees and get out of there before Alder and the others changed their minds.

"It's funny," Wade said behind him.

"It is," agreed Mackenzie. "Everything is funny here."

"I mean about those trees," said Wade. "I'd swear Delbert was all right. So were all the others. They played the same music the others played. If there had been any faulty orchestration, any digression from form, I am sure I would have noticed it."

Mackenzie spun around and grasped Wade by the arm. "You mean they weren't lousing up the concerts? That Delbert, here, played just like the rest?"

Wade nodded.

"That ain't so," shrilled Delbert from his perch on Smith's shoulder. "I wouldn't play like the rest of them. I want to kick the stuff around. I always dig it up and hang it out the window. I dream it up and send it away out wide."

"Where'd you pick up that lingo?" Mackenzie snapped. "I never heard anything like it before."

"I learned it all from him," declared Delbert, pointing at Wade.

Wade's face was purple and his eyes were glassy.

"It's practically prehistoric," he gulped. "It's terms that were used back in the twentieth century to describe a certain kind of popular rendition. I read about it in a history covering the origins of music. There was a glossary of the terms. They were so fantastic they stuck in my mind."

Smith puckered his lips, whistling soundlessly. "So that's how he picked it up. He caught it from your thoughts. Same principle the Encyclopedia uses, although not so advanced."

"He lacks the Encyclopedia's distinction," explained Mackenzie. "He didn't know the stuff he was picking up was something that had happened long ago."

"I have a notion to wring his neck," Wade threatened.

"You'll keep your hands off him," grated Mackenzie. "This deal stinks to the high heavens, but seven music trees are seven music trees. Screwy deal or not, I'm going through with it."

"Look, fellows," said Nellie, "I wish you wouldn't do it."

Mackenzie puckered his brow. "What's the matter with you, Nellie? Why did you make that uproar about the law down there? There's a rule, sure, but in a thing like this it's different. The company can afford to have a rule or two broken for seven music trees. You know what will happen, don't you, when we get those trees back home. We can charge a thousand bucks a throw to hear them and have to use a club to keep the crowds away."

"And the best of it is," Smith pointed out, "that once they hear them, they'll have to come again. They'll never get tired of them. Instead of that, every time they hear them, they'll want to hear them all the more. It'll get to be an obsession, a part of the people's life. They'll steal, murder, do anything so they can hear the trees."

"That," said Mackenzie, soberly, "is the one thing I'm afraid of."

"I only tried to stop you," Nellie said. "I know as well as you do that the law won't hold in a thing like this. But there was something else. The way the conductors sounded. Almost as if they were jeering at us. Like a gang of boys out in the street hooting at someone they just pulled a fast one on."

"You're batty," Smith declared.

"We have to go through with it," Mackenzie announced, flatly. "If anyone ever found we'd let a chance like this slip through our fingers, they'd crucify us for it."

"You're going to get in touch with Harper?" Smith asked.

Mackenzie nodded. "He'll have to get hold of Earth, have them send out a ship right away to take back the trees."

"I still think," said Nellie, "there's a nigger in the woodpile."

Mackenzie flipped the toggle and the visiphone went dead.

Harper had been hard to convince. Mackenzie, thinking about it, couldn't blame him much. After all, it did sound incredible. But then, this whole planet was incredible.

Mackenzie reached into his pocket and hauled forth his pipe and pouch. Nellie probably would raise hell about helping to dig up those other six trees, but she'd have to get over it. They'd have to work as fast as they could. They couldn't spend more than one night up here on the rim. There wasn't enough serum for longer than that. One jug of the stuff wouldn't go too far.

Suddenly excited shouts came from outside the car, shouts of consternation.

With a single leap, Mackenzie left the chair and jumped for the door. Outside, he almost bumped into Smith, who came running around the corner of the tractor. Wade, who had been down at the cliff's edge, was racing toward them.

"It's Nellie," shouted Smith. "Look at that robot!"

Nellie was marching toward them, dragging in her wake a thing that bounced and struggled. A rifle tree grove fired a volley and one of the pellets caught Nellie in the shoulder, puffing into dust, staggering her a little.

The bouncing thing was the Encyclopedia. Nellie had hold of his taproot, was hauling him unceremoniously across the bumpy ground.

"Put him down!" Mackenzie yelled at her. "Let him go!"

"He stole the serum," howled Nellie. "He stole the serum and broke it on a rock!"

She swung the Encyclopedia toward them in a looping heave. The intelligent vegetable bounced a couple of times, struggled to get right side up, then scurried off a few feet, root coiled tightly against its underside.

Smith moved toward it threateningly. "I ought to kick the living innards out of you," he yelled. "We need that serum. You knew why we needed it."

"You threaten me with force," said the Encyclopedia. "The most primitive method of compulsion."

"It works," Smith told him shortly.

The Encyclopedia's thoughts were unruffled, almost serene, as clear and concise as ever. "You have a law that forbids your threatening or harming any alien thing."

"Chum," declared Smith, "you better get wised up on laws. There are times when certain laws don't hold. And this is one of them."

"Just a minute," said Mackenzie. He spoke to the Encyclopedia. "What is your understanding of a law?"

"It is a rule you live by," the Encyclopedia said. "It is something that is necessary. You cannot violate it."

"He got that from Nellie," said Smith.

"You think because there is a law against it, we won't take the trees?"

"There is a law against it," said the Encyclopedia. "You cannot take the trees."

"So as soon as you found that out, you lammed up here and stole the serum, eh?"

"He's figuring on indoctrinating us," Nellie explained. "Maybe that word ain't so good. Maybe conditioning is better. It's sort of mixed up. I don't know if I've got it straight. He took the serum so we would hear the trees without being able to defend ourselves against them. He figured when we heard the music, we'd go ahead and take the trees."

"Law or no law?"

"That's it," Nellie said. "Law or no law."

Smith whirled on the robot. "What kind of jabber is this? How do you know what he was planning?"

"I read his mind," said Nellie. "Hard to get at, the thing that he was planning, because he kept it deep. But some of it jarred up where I could reach it when you threatened him."

"You can't do that!" shrieked the Encyclopedia. "Not you! Not a machine!"

Mackenzie laughed shortly. "Too bad, big boy, but she can. She's been doing it."

Smith stared at Mackenzie.

"It's all right," Mackenzie said. "It isn't any bluff. She told me about it last night."

"You are unduly alarmed," the Encyclopedia said. "You are putting a wrong interpretation—"

A quiet voice spoke, almost as if it were a voice inside Mackenzie's mind.

"Don't believe a thing he tells you, pal. Don't fall for any of his lies."

"Nicodemus! You know something about this?"

"It's the trees," said Nicodemus. "The music does something to you. It changes you. Makes you different than you were before. Wade is different. He doesn't know it, but he is."

"If you mean the music chains one to it, that is true," said Wade. "I may as well admit it. I could not live without the music. I could not leave the Bowl. Perhaps you gentlemen have thought that I would go back with you. But I cannot go. I cannot leave. It will work the same with anyone. Alexander was here for a while when he ran short of serum. Doctors treated him and said he was all right, but he came back. He had to come back. He couldn't stay away."

"It isn't only that," declared Nicodemus. "It changes you, too, in other ways. It can change you any way it wants to. Change your way of thinking. Change your viewpoints."

Wade strode forward. "It isn't true," he yelled. "I'm the same as when I came here."

"You heard things," said Nicodemus, "felt things in the music you couldn't understand. Things you wanted to understand, but couldn't. Strange emotions that you yearned to share, but could never reach. Strange thoughts that tantalized you for days."

Wade sobered, stared at them with haunted eyes.

"That was the way it was," he whispered. "That was just the way it was."

He glanced around, like a trapped animal seeking escape.

"But I don't feel any different," he mumbled. "I still am human. I think like a man, act like a man."

"Of course you do," said Nicodemus. "Otherwise you would have been scared away. If you had known what was happening to you, you wouldn't let it happen. And you have had less than a year of it. Less than a year of this conditioning. Five years and you would be less human. Ten years and you would be beginning to be the kind of thing the trees want you to be."

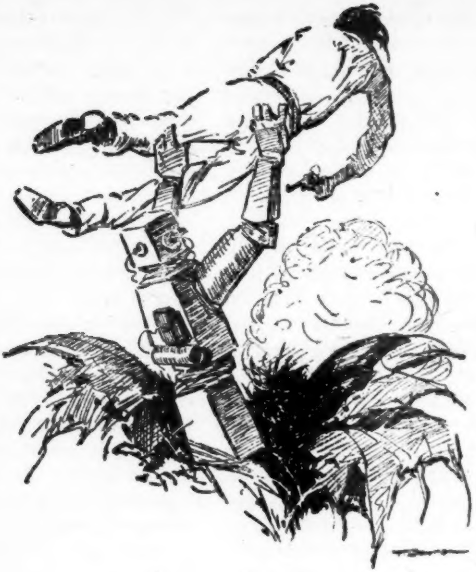
"And we were going to take some of those trees to Earth!" Smith shouted. "Seven of them! So the people of the Earth could hear them. Listen to them, night after night. The whole world listening to them on the radio. A whole world being conditioned, being changed by seven music trees."

"But why?" asked Wade, bewildered.

"Why did men domesticate animals?" Mackenzie asked. "You wouldn't find out by asking the animals, for they don't know. There is just as much point asking a dog why he was domesticated as there is in asking us why the trees want to condition us. For some purpose of their own, undoubtedly, that is perfectly clear and logical to them. A purpose that undoubtedly never can be clear and logical to us."

"Nicodemus," said the Encyclopedia and his thought was deathly cold, "you have betrayed your own."

Mackenzie laughed harshly. "You're wrong there," he told the vegetable, "because Nicodemus isn't a plant, any more. He's a human. The same thing has happened to



him as you want to have happen to us. He has become a human in everything but physical make-up. He thinks as a man does. His viewpoints are ours, not yours."

"That is right," said Nicodemus. "I am a man."

A piece of cloth ripped savagely and for an instant the group was blinded by a surge of energy that leaped from a thicket a hundred yards away. Smith gurgled once in sudden agony and the energy was gone.

Frozen momentarily by surprise, Mackenzie watched Smith stagger, face tight with pain, hand clapped to his side. Slowly the man wilted, sagged in the middle and went down.

Silently, Nellie leaped forward, was sprinting for the thicket. With a hoarse cry, Mackenzie bent over Smith.

Smith grinned at him, a twisted grin. His mouth worked, but no words came. His hand slid away from his side and he went limp, but his chest rose and fell with a slightly slower breath. His life blanket had shifted its position to cover the wounded side.

Mackenzie straightened up, hauling the pistol from his belt. A man had risen from the thicket, was leveling a gun at the charging Nellie. With a wild yell, Mackenzie shot from the hip. The lashing charge missed the man but half the thicket disappeared in a blinding sheet of flame.

The man with the gun ducked as the flame puffed out at him and in that instant Nellie closed. The man yelled once, a long-drawn howl of terror as Nellie swung him above her head and dashed him down. The smoking thicket hid the rest of it. Mackenzie, pistol hanging limply by his side, watched Nellie's right fist lift and fall with brutal precision, heard the thud of life being beaten from a human body.

Sickened, he turned back to Smith. Wade was kneeling beside the wounded man. He looked up.

"He seems to be unconscious."

Mackenzie nodded. "The blanket put him out. Gave him an anæsthesia. It'll take care of him."

Mackenzie glanced up sharply at a scurry in the grass. The Encyclopedia, taking advantage of the moment, was almost out of sight, scuttling toward a grove of rifle trees.

A step grated behind him.

"It was Alexander," Nellie said. "He won't bother us no more."

Nelson Harper, factor at the post, was lighting up his pipe when the visiphone signal buzzed and the light flashed on.

Startled, Harper reached out and snapped on the set. Mackenzie's face came in, a face streaked with dirt and perspiration, stark with fear. He waited for no greeting. His lips were already moving even as the plate flickered and cleared.

"It's all off, chief," he said. "The deal is off. I can't bring in those trees."

"You got to bring them in," yelled Harper. "I've already called Earth. I got them turning handsprings. They say it's the greatest thing that ever happened. They're sending out a ship within an hour."

"Call them back and tell them not to bother," Mackenzie snapped.

"But you told me everything was set," yelped Harper. "You told me nothing could happen. You said you'd bring them in if you had to crawl on hands and knees and pack them on your back."

"I told you every word of that," agreed Mackenzie. "Probably even more. But I didn't know what I know now."

Harper groaned. "Galactic is plastering every front page in the Solar System with the news. Earth radios right now are bellowing it out from Mercury to Pluto. Before another hour is gone every man, woman and child will know those trees are coming to Earth. And once they know that, there's nothing we can do. Do you understand that, Mackenzie? We have to get them there!"

"I can't do it, chief," Mackenzie insisted, stubbornly.

"Why can't you?" screamed Harper. "So help me Hannah, if you don't—"

"I can't bring them in because Nellie's burning them. She's down in the Bowl right now with a flamer.

When she's through, there won't be any music trees."

"Go out and stop her!" shrieked Harper. "What are you sitting there for! Go out and stop her! Blast her if you have to. Do anything, but stop her! That crazy robot—"

"I told her to," snapped Mackenzie. "I ordered her to do it. When I get through here, I'm going down and help her."

"You're crazy, man!" yelled Harper. "Stark, staring crazy. They'll throw the book at you for this. You'll be lucky if you just get life—"

Two darting hands loomed in the plate, hands that snapped down and closed around Mackenzie's throat, hands that dragged him away and left the screen blank, but with a certain blurring motion, as if two men might be fighting for their lives just in front of it.

"Mackenzie!" screamed Harper. "Mackenzie!"

Something smashed into the screen and shattered it, leaving the broken glass gaping in jagged shards.

Harper clawed at the visiphone. "Mackenzie! Mackenzie, what's happening!"

In answer the screen exploded in a flash of violent flame, howled like a screeching banshee and then went dead.

Harper stood frozen in the room, listening to the faint purring of the radio. His pipe fell from his hand and bounced along the floor, spilling burned tobacco.

Cold, clammy fear closed down upon him, squeezing his heart. A fear that twisted him and mocked him. Galactic would break him for this, he knew. Send him out to some of the jungle planets as the rankest subordinate. He would be marked for life, a man not to be trusted, a man who had failed to uphold the prestige of the company.

Suddenly a faint spark of hope stirred deep within him. If he could get there soon enough! If he could get to Melody Bowl in time, he might stop this madness. Might at least save something, save a few of the precious trees.

The flier was in the compound, waiting. Within half an hour he could be above the Bowl.

He leaped for the door, shoved it open and even as he did a pellet whistled past his cheek and exploded into a puff of dust against the door frame. Instinctively, he ducked and another pellet brushed his hair. A third caught him in the leg with stinging force and brought him down. A fourth puffed dust into his face.

He fought his way to his knees, was staggered by another shot that slammed into his side. He raised his right arm to protect his face and a sledge-hammer blow slapped his wrist. Pain flowed along his arm and in sheer panic he turned and scrambled on hands and knees across the threshold, kicked the door shut with his foot.

Sitting flat on the floor, he held his right wrist in his left hand. He tried to make his fingers wiggle

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and they wouldn't. The wrist, he knew, was broken.

After weeks of being off the beam, the rifle tree outside the compound suddenly had regained its aim and gone on a rampage.

Mackenzie raised himself off the floor and braced himself with one elbow, while with the other hand he fumbled at his throbbing throat. The interior of the tractor danced with wavy motion and his head thumped and pounded with pain.

Slowly, carefully, he inched himself back so he could lean against the wall. Gradually the room stopped rocking, but the pounding in his head went on.

Someone was standing in the doorway of the tractor and he fought to focus his eyes, trying to make out who it was.

A voice screeched across his nerves.

"I'm taking your blankets. You'll get them back when you decide to leave the trees alone."

Mackenzie tried to fashion words, but all he accomplished was a croak. He tried again.

"Wade?" he asked.

It was Wade, he saw.

The man stood within the doorway, one hand clutching a pair of blankets, the other holding a gun.

"You're crazy, Wade," he whispered. "We have to burn the trees. The human race never would be safe. Even if they fail this time, they'll try again. And again—and yet again. And some day they will get us. Even without going to Earth they can get us. They can twist us to their purpose with recordings alone. Long distance propaganda. Take a bit longer, but it will do the job as well."

"They are beautiful," said Wade. "The most beautiful things in all the universe. I can't let you destroy them. You must not destroy them."

"But can't you see," croaked Mackenzie, "that's the thing that makes them so dangerous. Their beauty, the beauty of their music, is fatal. No one can resist it."

"It was the thing I lived by," Wade told him, soberly. "You say it made me something that was not quite human. But what difference does that make. Must racial purity, in thought and action, be a fetish that would chain us to a drab existence when something better, something greater is offered. And we never would have known. That is the best of it all, we never would have known. They would have changed us, yes, but so slowly, so gradually, that we would not have suspected. Our decisions and our actions and our way of thought would still have seemed to be our own. The trees never would have been anything more than something cultural."

"They want our mechanization," said Mackenzie. "Plants can't develop machines. Given that they might have taken us along a road we, in our rightful heritage, never would have taken."

"How can we be sure," asked Wade, "that our heritage would have guided us aright?"

Mackenzie slid straighter against the wall. His head still throbbed and his throat still ached.

"You've been thinking about this?" he asked.

Wade nodded. "At first there was the natural reaction of horror. But, logically, that reaction is erroneous. Our schools teach our children a way of life. Our press strives to formulate our adult opinion and belief. The trees were doing no more to us than we do to ourselves. And perhaps, for a purpose no more selfish."

Mackenzie shook his head. "We must live our own life. We must follow the path the attributes of humanity decree that we should follow. And anyway, you're wasting your time."

"I don't understand," said Wade.

"Nellie already is burning the trees," Mackenzie told him. "I sent her out before I made the call to Harper."

"No, she's not," said Wade.

Mackenzie sat bolt upright. "What do you mean?"

Wade flipped the pistol as Mackenzie moved as if to regain his feet.

"It doesn't matter what I mean," he snapped. "Nellie isn't burning any trees. She isn't in a position to burn any trees. And neither are you, for I've taken both your flamers. And the tractor won't run, either. I've seen to that. So the only thing that you can do is stay right here."

Mackenzie motioned toward Smith, lying on the floor. "You're taking his blanket, too?"

Wade nodded.

"But you can't. Smith will die. Without that blanket he doesn't have a chance. The blanket could have healed the wound, kept him fed correctly, kept him warm—"

"That," said Wade, "is all the more reason that you come to terms directly."

"Your terms," said Mackenzie, "are that we leave the trees unharmed.

"Those are my terms."

Mackenzie shook his head. "I can't take the chance," he said.

"When you decide, just step out and shout," Wade told him. "I'll stay in calling distance."

He backed slowly from the door.

Smith needed warmth and food. In the hour since his blanket had been taken from him he had regained consciousness, had mumbled feverishly and tossed about, his hand clawing at his wounded side.

Squatting beside him, Mackenzie had tried to quiet him, had felt a wave of slow terror as he thought of the hours ahead.

There was no food in the tractor, no means for making heat. There was no need for such provision so long as they had had their life blankets—but now the blankets were gone. There was a first-aid cabinet and with the materials that he found there, Mackenzie did his fumbling best, but there was nothing to relieve Smith's pain, nothing to control his fever. For treatment such as that they had relied upon the blankets.

The atomic motor might have been rigged up to furnish heat, but Wade had taken the firing mechanism control.

Night was falling and that meant the air would grow colder. Not too cold to live, of course, but cold enough to spell doom to a man in Smith's condition.

Mackenzie squatted on his heels and stared at Smith.

"If I could only find Nellie," he thought.

He had tried to find her—briefly. He had raced along the rim of the Bowl for a mile or so, but had seen no sign of her. He had been afraid to go farther, afraid to stay too long from the man back in the tractor.

Smith mumbled and Mackenzie bent low to try to catch the words. But there were no words.

Slowly he rose and headed for the door. First of all, he needed heat. Then food. The heat came first. An open fire wasn't the best way to make heat, of course, but it was better than nothing.

The uprooted music tree, balled roots silhouetted against the sky, loomed before him in the dusk. He found a few dead branches and tore them off. They would do to start the fire. After that he would have to rely on green wood to keep it going. Tomorrow he could forage about for suitable fuel.

In the Bowl below, the music trees were tuning up for the evening concert.

Back in the tractor, he found a knife, carefully slivered several of the branches for easy lighting, piled them ready for his pocket lighter.

The lighter flared and a tiny figure hopped up on the threshold of the tractor, squatting there, blinking at the light.

Startled, Mackenzie held the lighter without touching it to the wood, stared at the thing that perched in the doorway.

Delbert's squeaky thought drilled into his brain.

"What you doing?"

"Building a fire," Mackenzie told him.

"What's a fire?"

"It's a . . . it's a . . . say, don't you know what a fire is?"

"Nope," said Delbert.

"It's a chemical action," Mackenzie said. "It breaks up matter and releases energy in form of heat."

"What you building a fire with?" asked Delbert, blinking in the flare of the lighter.

"With branches from a tree."

Delbert's eyes widened and his thought was jittery.

"A tree?"

"Sure, a tree. Wood. It burns. It gives off heat. I need heat."

"What tree?"

"Why—" And then Mackenzie stopped with sudden realization. His thumb relaxed and the flame went out.

Delbert shrieked at him in sudden terror and anger. "It's my tree! You're building a fire with my tree!"

Mackenzie sat in silence.

"When you burn my tree, it's gone," yelled Delbert. "Isn't that right? When you burn my tree, it's gone?"

Mackenzie nodded.

"But why do you do it?" shrilled Delbert.

"I need heat," said Mackenzie, doggedly. "If I don't have heat, my friend will die. It's the only way I can get heat."

"But my tree!"

Mackenzie shrugged. "I need a fire, see? And I'm getting it any way I can."

He flipped his thumb again and the lighter flared.

"But I never did anything to you," Delbert howled, rocking on the metal door sill. "I'm your friend, I am. I never did a thing to hurt you."

"No?" asked Mackenzie.

"No," yelled Delbert.

"What about that scheme of yours?" asked Mackenzie. "Trying to trick me into taking trees to Earth?"

"That wasn't my idea," yipped Delbert. "It wasn't any of the trees' ideas. The Encyclopedia thought it up."

A bulky form loomed outside the door. "Someone talking about me?" it asked.

The Encyclopedia was back again.

Arrogantly, he shouldered Delbert aside, stepped into the tractor.

"I saw Wade," he said.

Mackenzie glared at him. "So

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DETECTIVE
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AT ALL NEWSSTANDS

you, figured it would be safe to come."

"Certainly," said the Encyclopedia. "Your formula of force counts for nothing now. You have no means to enforce it."

Mackenzie's hand shot out and grasped the Encyclopedia with a vicious grip, hurled him into the interior of the tractor.

"Just try to get out this door," he snarled. "You'll soon find out if the formula of force amounts to anything."

The Encyclopedia picked himself up, shook himself like a ruffled hen. But his thought was cool and calm.

"I can't see what this avails you."

"It gives us soup," Mackenzie snapped.

He sized the Encyclopedia up. "Good vegetable soup. Something like cabbage. Never cared much for cabbage soup, myself, but—"

"Soup?"

"Yeah, soup. Stuff to eat. Food."

"Food!" The Encyclopedia's thought held a tremor of anxiety. "You would use me as food."

"Why not?" Mackenzie asked him. "You're nothing but a vegetable. An intelligent vegetable, granted, but still a vegetable."

He felt the Encyclopedia's groping thought fingers prying into his mind.

"Go ahead," he told him, "but you won't like what you find."

The Encyclopedia's thoughts almost gasped. "You withheld this from me!" he charged.

"We withheld nothing from you," Mackenzie declared. "We never had occasion to think of it . . . to remember to what use Men at one time put plants, to what use we still put plants in certain cases. The only reason we don't use them so extensively now is that we have advanced beyond the need of them. Let that need exist again and—"

"You ate us," strummed the Encyclopedia. "You used us to build your shelters! You destroyed us to create heat for your selfish purposes!"

"Pipe down," Mackenzie told him. "It's the way we did it that gets you. The idea that we thought we had a right to. That we went out and took, without even asking, never wondering what the plant might think about it. That hurts your racial dignity."

He stopped, then moved closer to the doorway. From the Bowl below came the first strains of the music. The tuning up, the preliminary to the concert was over.

"O. K.," Mackenzie said, "I'll hurt it some more. Even you are nothing but a plant to me. Just because you've learned some civilized tricks doesn't make you my equal. It never did. We humans can't slur off the experiences of the past so easily. It would take thousands of years of association with things like you before we even began to regard you as anything other than a plant, a thing that we used in the past and might use again."

"Still cabbage soup," said the Encyclopedia.

"Still cabbage soup," Mackenzie told him.

The music stopped. Stopped dead still, in the middle of a note.

"See," said Mackenzie, "even the music fails you."

Silence rolled at them in engulfing waves and through the stillness came another sound, the *clop, clop* of heavy, plodding feet.

"Nellie!" yelled Mackenzie.

A bulky shadow loomed in the darkness.

"Yeah, chief, it's me," said Nellie. "I brung you something."

She dumped Wade across the doorway.

Wade rolled over and groaned. There were skittering, flapping sounds as two fluttering shapes detached themselves from Wade's shoulders.

"Nellie," said Mackenzie, harshly, "there was no need to beat him up. You should have brought him back just as he was and let me take care of him.

"Gee, boss," protested Nellie. "I didn't beat him up. He was like that when I found him."

Nicodemus was clawing his way to Mackenzie's shoulder, while Smith's life blanket scuttled for the corner where his master lay.

"It was us, boss," piped Nicodemus. "We laid him out."

"You laid him out?"

"Sure, there was two of us and only one of his. We fed him poison."

Nicodemus settled into place on Mackenzie's shoulders.

"I didn't like him," he declared. "He wasn't nothing like you, boss. I didn't want to change like him. I wanted to stay like you."

"This poison?" asked Mackenzie. "Nothing fatal, I hope."

"Sure not, pal," Nicodemus told him. "We only made him sick. He didn't know what was happening until it was too late to do anything about it. We bargained with him, we did. We told him we'd quit feeding it to him if he took us back. He was on his way here, too, but he'd never made it if it hadn't been for Nellie."

"Chief," pleaded Nellie, "when he gets so he knows what it's all about, won't you let me have him for about five minutes?"

"No," said Mackenzie.

"He strung me up," wailed Nellie. "He hid in the cliff and lassoed me and left me hanging there. It took me hours to get loose. Honest, I wouldn't hurt him much. I'd just kick him around a little, gentle-like."

From the cliff top came the rustling of grass as if hundreds of little feet were advancing upon them.

"We got visitors," said Nicodemus.

The visitors, Mackenzie saw, were the conductors, dozens of little gnomelike figures that moved up and squatted on their haunches, faintly luminous eyes blinking at them.

One of them shambled forward.

As he came closer, Mackenzie saw that it was Alder.

"Well?" Mackenzie demanded.

"We came to tell you the deal is off," Alder squeaked. "Delbert came and told us."

"Told you what?"

"About what you do to trees."

"Oh, that."

"Yes, that."

"But you made the deal," Mackenzie told him. "You can't back out now. Why, Earth is waiting breathless—"

"Don't try to kid me," snapped Alder. "You don't want us any more than we want you. It was a dirty trick to start with, but it wasn't any of our doing. The Encyclopedia talked us into it. He told us we had a duty. A duty to our race. To act as missionaries to the inferior races of the Galaxy.

"We didn't take to it at first. Music, you see, is our life. We have been creating music for so long that our origin is lost in the dim antiquity of a planet that long ago has passed its zenith of existence. We will be creating music in that far day when the planet falls apart beneath our feet. You live by a code of accomplishment by action. We live by a code of accomplishment by music. Kadmar's Red Sun symphony was a greater triumph for us than the discovery of a new planetary system is for you. It pleased us when you liked our music. It will please us if you still like our music, even after what has happened. But we will not allow you to take any of us to Earth."

"The monopoly on the music still stands?" asked Mackenzie.

"It still stands. Come whenever you want to and record my symphony. When there are others we will let you know."

"And the propaganda in the music?"

"From now on," Alder promised, "the propaganda is out. If, from now on, our music changes you, it will change you through its own power. It may do that, but we will not try to shape your lives."

"How can we depend on that?"

"Certainly," said Alder, "there are certain tests you could devise. Not that they will be necessary."

"We'll devise the tests," declared Mackenzie. "Sorry, but we can't trust you."

"I'm sorry that you can't," said Alder, and he sounded as if he were.

"I was going to burn you," Mackenzie said, snapping his words off brutally. "Destroy you. Wipe you out. There was nothing you could have done about it. Nothing you could have done to stop me."

"You're still barbarians," Alder told him. "You have conquered the distances between the stars, you have built a great civilization, but your methods are still ruthless and degenerate."

"The Encyclopedia calls it a formula of force," Mackenzie said. "No matter what you call it, it still works. It's the thing that took us up. I warn you. If you ever again try to trick the human race, there will be hell to pay. A human being will destroy anything to save himself. Remember that—we destroy anything that threatens us."

Something swished out of the tractor door and Mackenzie whirled about.

"It's the Encyclopedia!" he yelled. "He's trying to get away! Nellie!"

There was a thrashing rustle. "Got him, boss," said Nellie.

The robot came out of the darkness, dragging the Encyclopedia along by his leafy topknot.

Mackenzie turned back to the composers, but the composers were gone. The grass rustled eerily toward the cliff edge as dozens of tiny feet scurried through it.

"What now?" asked Nellie. "Do we burn the trees?"

Mackenzie shook his head. "No, Nellie. We won't burn them."

"We got them scared," said Nellie. "Scared pink with purple spots."

"Perhaps we have," said Mackenzie. "Let's hope so, at least. But it isn't only that they're scared. They probably loathe us and that is better yet. Like we'd loathe some form of life that bred and reared men for food—that thought of Man as nothing else than food. All the time they've thought of themselves as the greatest intellectual force in the universe. We've given them a jolt. We've scared them and hurt their pride and shook their confidence. They've run up against something that is more than a match for them. Maybe they'll think twice again before they try any more shenanigans."

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Down in the Bowl the music began again.

Mackenzie went in to look at Smith. The man was sleeping peacefully, his blanket wrapped around him. Wade sat in a corner, head held in his hands.

Outside a rocket murmured and Nellie yelled. Mackenzie spun on his heel and dashed through the door. A ship was swinging over the Bowl, lighting up the area with floods. Swiftly it swooped down, came to ground a hundred yards away.

Harper, right arm in a sling, tumbled out and raced toward them.

"You didn't burn them!" he was yelling. "You didn't burn them!"

Mackenzie shook his head.

Harper pounded him on the back with his good hand. "Knew you wouldn't. Knew you wouldn't all the time. Just kidding the chief, eh? Having a little fun."

"Not exactly fun."

"About them trees," said Harper. "We can't take them back to Earth, after all."

"I told you that," Mackenzie said.

"Earth just called me, half an hour ago," said Harper. "Seems there's a law, passed centuries ago. Against bringing alien plants to Earth. Some lunkhead once brought a bunch of stuff from Mars that just about ruined Earth, so they passed the law. Been there all the time, forgotten."

Mackenzie nodded. "Someone dug it up."

"That's right," said Harper. "And slapped an injunction on Galactic. We can't touch those trees."

"You wouldn't have anyhow," said Mackenzie. "They wouldn't go."

"But you made the deal! They were anxious to go—"

"That," Mackenzie told him, "was before they found out we used plants for food—and other things."

"But . . . but—"

"To them," said Mackenzie, "we're just a gang of ogres. Something they'll scare the little plants with. Tell them if they don't be quiet the humans will get 'em."

Nellie came around the corner of the tractor, still hauling the Encyclopedia by his topknot.

"Hey," yelled Harper, "what goes on here?"

"We'll have to build a concentration camp," said Mackenzie. "Big high fence." He motioned with his thumb toward the Encyclopedia.

Harper stared. "But he hasn't done anything!"

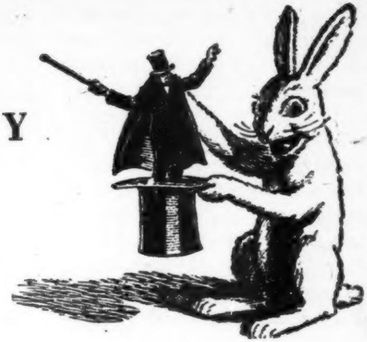
"Nothing but try to take over the human race," Mackenzie said.

Harper sighed. "That makes two fences we got to build. That rifle tree back at the post is shooting up the place."

Mackenzie grinned. "Maybe the one fence will do for the both of them."

THE END.

PROBABILITY ZERO



SOURDOUGH

By George Holman

"Gimme a nickel fur a cup o' coffee, young feller."

"Sure," I said, and flipped a coin to the old man who had accosted me just outside the No. 3 Venusian spaceport.

The old man caught the coin with a quick stab of a horny hand. "Thankee, son; thankee," he said. "Be you a prospector?"

"Yes," I replied. "I've heard of some rich finds here."

"Fur some," the old man said gloomily. "Venus ain't like Earth. There ain't no outcroppin's here. The land is covered a mile or two deep with humus, peat, dead leaves an' trees. There ain't no bacterium here to eat up this stuff. The real rocks an' clays are under it. You kin prospect fur y'ars. Then you either strike it rich an' wind up a big banker like Jim Cramer; or you wind up like me, beggin' nickels fur a cup o' coffee or a sandwich."

"And you were once a prospector?" I asked.

"Yup," the old man replied. "I would be yet if I had any backin'."

"Why will nobody grubstake you?" I asked.

"'Cause I'm Hardluck Hadley," the old man explained. "It ain't that I cain't find nothin'. It's what happens afterward that makes people call me Hardluck," he added. "I started prospectin' back on Earth. In Mexico I found the Madre d'Oro. I was gittin' ready to mine it when Sanders popped up with his process o' takin' unlimited amounts o' gold frum sea water. Gold got cheap, an' I went to the wall.

"Space travel was gittin' under way about that time, so I lit out fur Mars. Fur five y'ars—Mars y'ars, mind you—I prospected fur diamonds. Then I struck it rich. I loaded up a hundred pounds o' the biggest rocks any man ever saw an' headed back to Earth to the Brazilian-Afrikan syndicate. An' you know what them skunks done?

They throwed me and my diamonds out. While I was prospectin', some danged Swede had invented a cheap way to make diamonds o' any color or size.

"Venus was bein' settled then. So I come here. I got me a drillin' rig, an' went prospectin' fur oil. Found 'er, too; a gusher that blowed a mile high. I filed claim to the pool, but before I could start develópin' it, up popped Chang an' Marshall with that cheap-as-dirt atomic energy. I was sunk ag'in.

"I saved my rig out o' the bankruptcy proceedin's, an' just to be doin' somethin', I took it north to Palm Island in the Emerald Sea. I drilled a hole, an' what do you think I found? Black coffee! Better than any coffee ever brewed in a pot. Seems like Palm Island had been a thicket o' coffee-berry bushes a million or so y'ars back. 'Cause there wasn't no germs to make the berries rot, they built up to a sizable thickness y'ar after y'ar. By an' by the ground sunk, an' they was covered over. They sunk deep enough fur the internal heat o' Venus to roast 'em. Then hot water broke into the seam, an' there was the finest coffee any man ever smacked his lips over.

"Waal, I organized me a comp'ny an' took out a charter fur a pipe line to be laid frum my coffee wells to the city. Then I found I had a competitor by the name o' Jim Cramer. Jim had struck coffee on the beach o' the Sugar Sea south o' here. In case you ain't heard, Sugar Sea has water in it as sweet as honey. To reach the coffee sands, Jim drilled through a stratum o' sugar cane a hundred foot thick.

"Fur a while it was nip an' tuck as to who'd git the city franchise, Jim or me. We both got orders to hold up construction till the board o' aldermen could decide who had the best coffee. They asked fur samples, an' we obliged. They sampled mine; then they sampled Jim's. Then they give the contract to Jim an' ordered my pool closed till his coffee is all gone.

"You see, the water frum the Sugar Sea had seeped into the coffee-bean seam Jim had drilled into, so his coffee was already sweetened. Besides, he had to pump it up through a seam of these Venusian milkweeds, so it had cream in it, too.

"Worst of all, I've got to bum nickels to buy Jim's coffee with," the old prospector sighed.

LIGHT TRAP

By Jerry Shelton

"What do you mean—'too much research hinders the advancement of science'?" Young Norton sounded indignant as he removed his laboratory apron and hung it in the locker. "Research is the soul of science," he said precisely.

"Sometimes," muttered old Pop Weatherman, and picked up a broom. "Look at me. I'd be a specialist yet and a millionaire to boot —if it hadn't been for some smart-Aleck research technicians. Now I'm sweeping floors in this lab."

Norton sighed and looked at his watch. "Go on—I suppose I've got time."

Pop leaned on his broom. "You technicians in here are still burning the midnight oil trying to find a new source of cheap power—aren't you?"

Norton nodded and began to put on his coat.

"Well, sir"—Pop's eyes were dreamy—"when I was a youngster in this lab, another fellow and I—quite by accident—discovered Reflect-All."

"You mean that one hundred percent reflecting material used on—"

"Yep—didn't make any money out of it. The company owned the rights." Pop took a deep breath and continued, "Anyhow, we quit the lab and set up our own shop. We had discovered something else."

Norton cocked his blond head.

Pop appeared not to notice. "We'd discovered that if we coated the *inside* of a hollow metal sphere with Reflect-All and projected a powerful beam of light into a small opening and then sealed the opening shut—that the light, being one hundred percent reflected and having no exit, would keep bouncing back and forth, generating heat continuously. The heat created more light and the light created more heat and so on. Those things really radiated power—and cheap."

Norton's blue eyes widened. "I think I heard a rumor about those Light-Trap motors when I was in school. I thought—"

Pop snorted. "Never mind what you thought. The main thing is that they worked—and worked wonderful. We had a big company, started making all kinds of motors for all purposes and they worked swell. Everybody was using them all over the country and the problem of cheap power seemed solved until—"

Pop began to sweep the floor mechanically and then: "—until some smart-Aleck technicians started to conduct some research on those Light-Trap motors to try to make them more efficient."

"What *did* happen? Cheap power would solve—"

"Well, those technicians found out that those Light-Trap motors were theoretically impossible—and naturally, as soon as everyone knew the process was impossible—the blame things wouldn't work!"

Norton slammed the door.

PICTURE FROM TOKYO

By H. O. Hoadley

Captain Frunch was disturbed. He laid his cap on the desk and ran his fingers through his hair. His swearing was heartfelt, even though it was almost inaudible. The captain was the officer in charge of the photographs of enemy countries which the army had requested American tourists to send them. At the moment he was regarding, glumly and hatefully, a negative which had arrived in the morning mail.

"Sergeant! Sergeant Beezler!" he called, and his chief technician strode in and saluted.

"Look at this photograph of Kobe harbor, sergeant. Just what we've been looking for. But why—oh, why is it that the most important details are always hidden behind a big, fat female tourist in the foreground? And this bird had to be the one in ten who knows how to focus a camera so his charming companion is sharp as a needle, and the important parts of the picture are fuzzy.

"Oh, well, sergeant, it's the best we have; see what you can do with it." And the sergeant headed for the darkroom with the offending negative.

Later in the day Captain Frunch stuck his head cautiously in the darkroom door.

"Sergeant Beezler! How are you coming with that Kobe negative?"

"Coming right up, sir," was the reply. "The print will be off the drier in a couple of minutes." Five minutes later the sergeant laid the glossy enlargement on the captain's desk.

"Sergeant! This is wonderful!" exclaimed the captain, looking up. "What happened to the dame that was hiding those fueling docks? And how on earth did you get it so sharp?"

"Well, sir," the sergeant explained, "I used to be a pretty good portrait retoucher before I got in the army. It wasn't much of a job to retouch the girl friend right out of the picture; and, of course, as soon as she was gone, you could see what was behind her."

"Excellent," said the captain "but the picture was so fuzzy. What could you do about that?"

"That was easier, sir. I figured how much out of focus the camera must have been and just threw the enlarger out of focus by the same amount."

THE VACUUMULATOR

By Malcolm Jameson

Professor Gnitwitt beamed in triumph on his visitors.

"Yes," he chortled, "this is it—the machine that will make a perfect vacuum. Inspect it!"

They inspected it, frowning, muttering, stroking beards or massaging bald pates. It was undoubtedly a weird contraption. It resembled a bathysphere in being a ruggedly built sphere, in one side of which there was a lensed window with a sliding cover. At its top there was a small gooseneck vent pipe in whose stem there was a check valve. Nearby stood a battery of powerful arclights focused on the aperture in the vacuumulator. A glance at a diagram hanging on the wall told them that the sphere was hollow, its only internal feature being that it was lined with a myriad of faceted mirrors.

Professor Gnitwitt passed around dark glasses. Then he reached for the switch and turned on the lights.

"The vacuumulator is at present filled with air. I illuminate it in the ordinary way. I increase the illumination and the light pressure until the sphere is *filled* with light. See?"

No one could; the lights were blinding.

"Now," went on the triumphant Gnitwitt, "since it is filled with light there can be no room for air. That has escaped by means of the relief valve at the top, but the vent being goosenecked and also lined with black velvet prevents any of the light from escaping. Therefore we have replaced the air by light. We shut off the light. Now there is nothing. Q. E. D.!"

"Not for my money," snorted Dr. U. Wood. "You closed the entry port, true enough, but the sphere is still full of light. By your own assertion, no light can escape. It is still in there, bouncing from mirror to mirror."

"Precisely."

Now Professor Gnitwitt *was* triumphant.

"You forget Short's Law of Light," he hurled at him, disdainfully. "According to Short, light is slowed, dissipated and weakened by its many rapid journeys back and forth and the wear and tear on it of so many abrupt reversals. It lags, it reddens, it dims. It—to be brief, my learned colleague—*it tires!* It lies down. It quits. And when light quits, you have nothing. We have, in Short, a vacuum."

CASH ON THE DIMENSION

By Ray Karden

See that guy over there? Yeah, that's the one I mean. Remember, I was telling you about him. Who is he? What a memory you've got. He's a science-fiction author; probably the best one extant now. Writes for *Science Book* exclusively—one story a year, a seventy-thousand-word novel. He looks richer than that, you say; he looks like he spends a hundred times what he would get.

Well, he does—only he makes five hundred times that. After observing him a couple days, you can believe whatever story I tell about him, you say. Maybe. We'll see.

He was just starting twenty years ago. Maybe you were too young to remember about it. But he was a poor author then, as he is now. You don't agree with me, but if you had his advantages—

Well, none of the big science slicks were here then, didn't come till after *the* war, with the futuristic uptrend in everything else—you must know the story of the establishment of *Science Book, Science Trails,* and all the others glutting the stands. But to get back to the guy: He was writing then, made quite a name with his short stories, only they appeared very occasionally. A name, yes, but not a living. You see, he was a very slow writer, and he had to revise constantly—pure hack otherwise, you know.

The job that supported him was

in a physics laboratory. He had an original mind, but didn't have a very good grip of the principles. However, he had a knack of taking other peoples' ideas and using them for his own ends—like his stories.

That was where he got the idea for his Dimension Travel Machine. You know dimension travel—based on the idea that there are such things as time branches from the same stem—like a tree, of course.

Yes, the theory *is* receiving favorable glances from people who deal in those things—but what they don't know is that the guy you see over there has already not invented but, say, used such a thing.

He discovered it accidentally, of course; probably touched something or other in the routine course—but he was quick to capitalize on it.

You see, the first thing he found was that there were dimension stations here already, by the races on those other worlds more highly advanced than ours—or, I should say, parallel worlds. They simply didn't let him communicate the information to others; Earth not advanced enough.

He made an extensive course of travels through those worlds, with the help of the dimension stations, which didn't mind at all, as long as it wasn't widely known. Among other things, he found out the most interesting and valuable information to him—that there are five hundred or so different branches resembling our world in most aspects and derived from us.

Well, he wrote a series of stories based on the worlds he visited—later collected in a book and now in the twentieth edition. That's what made him famous—seemed to have an unusual amount of realism.

But he found that he simply couldn't stand the strain of writing so much and so hastily. It was then that he worked out the plan he uses now. But I must explain that all the dimension stations are post offices and material things may be mailed, you know, between them as between cities.

This plan is wonderful for him now; no doubt you've guessed it already. It's quite simple: As I said, there are over five hundred worlds almost exactly like our own, derived from our branch recently. Well, he just writes his novel very leisurely, a chapter a week or so, with plenty of time for vacations; when it's done he has five hundred copies mimeographed and sends them to that many editors in that many dimension branches; the stations effect the transference for him of the cash and manuscripts. He's sure to sell a good ninety percent of his stories, so he gets at least four hundred and fifty times what he would otherwise. He's rich!

You ask how I know all this, and why don't I imitate him? I'm afraid I couldn't do that; the Dimension Service has quite strict rules against employees participating in interdimension activities, but I understand *you're* a writer, and for a fee of ten percent I'm sure we could—

THE END.

Postwar Plan for Mars

Continued from page 114

staying out all night at his telescope.

I left the sixty-inch thoroughly dejected. I was picking my way through the dark with some vague notion of trying another drawing, when a flashlight came bobbing down the path toward the one-hundred-inch. Coming closer it proved to be the observer himself. He had wandered out to smoke a pipe and relax a bit until his next object had risen high enough to start an exposure.

We strolled along, chatting of many things. I called his attention to the fine appearance of Mars, now rising to meet the meridian. He acknowledged its pleasing aspect and expressed pleasure at the remarkable seeing that night. Other more mundane affairs seemed to weigh heavily on his mind, however. He was worried about the Russians who seemed unable to stem the Nazi tide. The income tax. His car was wearing out, too. Maybe he should get a new one. Yes, he admitted, knocking the ashes from his pipe, things were getting pretty tough.

Then suddenly he made a proposal. There was still an hour yet before N. G. C. 1285 would be in position. Suppose we took a look at Mars in the meantime.

He gave me an eyepiece that magnified one thousand and brought Mars within an optical distance of thirty-eight thousand miles. Yet even under this power the image was painfully bright, so bright that all sensation of color was washed away. The pink deserts were turned into a yellowish white like the moon at full; the olive-green areas were dirty brown patches. The whole appearance was so contrary to that at the six-inch it was hard to believe the two were one and the same object. I recognized part of the outline of the Sabaeus Sinus but the other markings were like a strange map. Of course, Mars had rotated a few degrees since my original look but not enough to alter it that much.

And if detection of the canals before had been difficult, now it seemed absolutely hopeless. I could not discern so much as the shadow of the ghost of a canal. You got the impression very strongly that there never could be such a thing as a canal on that flat expanse of moonlike yellow disk.

It would have made a fitting climax to have told how each step upward in power had brought the canals closer and closer, until in the world's largest telescope* they burst into view, covering the planet with a mesh of great circle lines. But like the old lady who searched in vain for the ice cubes, truth compels me to confess that after studying Mars under the most favorable seeing conditions through four in-

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***All construction on the 200-inch has stopped for the duration.**

struments of widely different power, the detail grew progressively less linelike if anything with each increase in aperture. I do not attempt to account for this circumstance. I merely report what happened to me.

Thus my own limited observations so far as the canals are concerned are decidedly negative in character. But now, to show the other side of the picture, let me recount the experiences of an astronomer friend that are of a diametrically opposite type.

To the best of my knowledge, until the opposition of July, 1939, his observations of Mars had been about as limited as my own. He had never been able to see the canals and was inclined to question their existence. Since his field was solar astrophysics he had never taken time to give the matter serious thought, when he thought of it at all.

Some years ago, by rare good fortune, he had acquired a six-inch objective by Alvan Clark & Sons. Using the objective as a nucleus, he had built an observatory around it that developed into a marvel of what limited means can accomplish when backed by mechanical ingenuity. The telescope not only became an aid in his solar researches, but a convenient way of examining celestial objects of current interest. Often neighbors were invited over for a look at Saturn and a new comet, refreshed in between by cookies and cooling draughts of cider.

Early one morning he was awakened by a car violently backfiring as it jerked past his home. Unable to go back to sleep, he recollected that Mars should be well placed for observation, perhaps might have a soothing effect on the central nervous system. He decided it would be worth trying anyhow.

The night was exceptionally calm and still. Upon opening the dome, or roof in this case, and setting the telescope on the planet, he found the disk beautifully defined. He studied it under several powers, finally trying his eyepiece of shortest focus, giving a magnification of nearly five hundred—which is plenty for a six-inch.

Then all at once it happened. For the first time in his life he saw a canal: clear, sharp, unmistakable in character. Before dawn he was able to pick out several others.

After that it was like living in fairyland. He could see canals on Mars whenever he liked. I was with him one night when he was busily sketching the planet through a twenty-inch reflector, drawing in canals at a great rate. At times he would pause for some comment as to their form and position. After he was through I had a look in the eyepiece myself but the canals still obstinately refused to come. However, my friend admitted they were rather "broad" that evening.

Will the questions of the canals ever be settled? Or will astronomers forever be divided into two opposing camps, the "Canal Men" and the "No-Canal Men," as society is divided into the Have's and the Have-Not's?

The usual explanation is that the canals are merely subjective, an optical illusion arising from our process of visual perception. The eye is a marvelous natural integrating machine. It gathers everything together that it sees. We glance at the stars and immediately start grouping them into lines and clusters. We look at a tree and instead of analyzing it into leaves and branches, integrate the whole mass into clumps of foliage. Many experiments have been performed based upon this integrating power of the eye.

The most famous of these is the one by Evans and Maunder on some English schoolboys back in 1902. I confess that I once dallied with the idea of repeating their experiment, even going so far as to look up the original paper in the *Monthly Notices of the Royal Astronomical Society*.

It seemed they had used classes of twenty boys ranging in age from twelve to fourteen selected from the Royal Hospital School at Greenwich. The boys were seated at different distances from a circular disk upon which were drawn markings on a certain hemisphere of Mars, except the canals were omitted. Each boy was told to draw as accurately as possible exactly what he saw upon the disk. All were supposedly ignorant of the appearance of Mars through a telescope. They were simply shown an odd-looking figure and told to reproduce it as best they could.

It must be conceded that boys just on the limit of distinct visibility drew lines bearing a startling resemblance to the canals. Not only did they insert lines where none existed on the disk, but they drew lines where canals appear on the recognized maps of Mars. In all they drew twelve lines that could be attributed to well-known canals. Also, it was evident that on the average the boys who were the best draftsmen were the best at putting in canals. One lad named Allen was a whiz at inserting canals. (I wonder what he is doing now?) From which Evans and Maunder concluded that the numerous observers who had so painstakingly been charting canals for the last twenty-five years had indeed been drawing precisely what they saw, except that what they saw had no existence in reality.

Incredible as it sounds, the latest news from Mars comes from the last place one might expect the inhabitants to be concerned with what goes on in the starry heavens. In France, among the Pyrenees, is a peak nine thousand feet high known as the Pic du Midi. At its base is the famous Grotto of Lourdes, subject of the recent best seller, "The Song of Bernadette." For over a decade an observatory has been active on the Pic du Midi, devoted chiefly to solar work. It was there that the young Belgian astronomer, Bernard Lyot, in 1929 secured the first photographs of the corona without an eclipse. Undoubtedly the Pic du Midi is blessed with the finest seeing and the most transparent skies of perhaps any observatory site in the world.

Now in addition to his renowned observations of the corona, Lyot and his co-workers have gotten drawings and photographs of Mars that promise to make astronomical history.

At the opposition of 1941 they studied Mars both visually and photographically with a fifteen-inch — thirty-eight-centimeter — refractor borrowed from the Observatory at Toulouse. According to Lyot, when taken to the Pic du Midi it "showed finer detail on the planet Mars than has been observed with the eighty-three-centimeter at Meudon under the best seeing conditions."

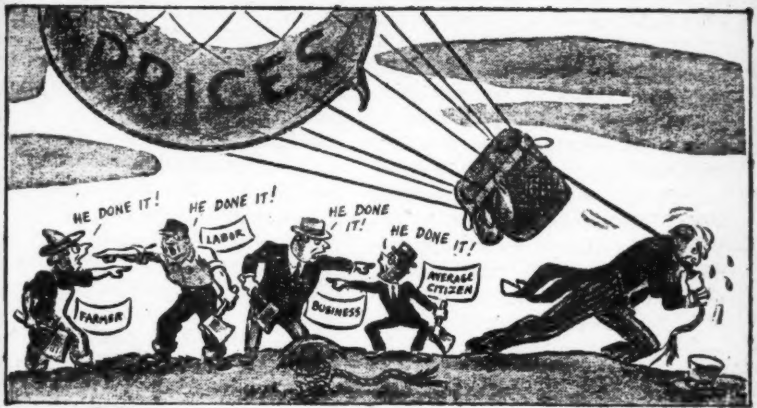
These extensive visual observations were combined into a map of the planet on Mercator's projection. At first they felt that certain of the details were too geometrical, too artificial in form, to be real. But in every case, the canals and other fine details on the maps were fully confirmed by the photographs taken with the same instrument.

Several hundred photographs were also secured during opposition, which were taken to Meudon the following winter for study. From these Lyot prepared a series of eighteen composite photographs of the planet. For each positive several negatives were superimposed. In this way, the chance plate grain and dust effects of a single photograph were eliminated, but faint details common to all were brought out in stronger contrast. These composite photographs were exhibited at a meeting of the Société de France early in May, 1942. So far no copies have been received in the United States.

But, with a few notable exceptions such as these, little if any work on Mars of a serious systematic type is attempted at most large observatories. At present, any kind of work is virtually at a standstill, since astronomical observatories, like other nonessential institutions, are severely curtailed both as to staff and equipment. And as long as the war lasts no improvement is likely.

But this situation is by no means the result of the war. It existed years ago when Pearl Harbor to most of us meant only a bay below Punch Bowl Hill where that Chinese detective, Charlie Chan, lived.

That this lackadaisical attitude is not a recent development may be readily demonstrated by a snap survey of a scientific journal such as that published by the Astronomical Society of the Pacific. This is just the kind of journal which would welcome semipopular notes, observations, and lectures on Mars. To make the case especially favorable for the opposition, we will take the five volumes from 1924 to 1928, inclusive, which contains the ex-



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tremely favorable oppositions of 1924 and 1926.

We find during this interval twenty papers on Mars, occupying eighty-four pages. The total number of pages published by the society from 1924 to 1928 was 1,929. Thus only 4.4 percent of the subject matter discussed pertained to Mars. While it is manifestly unfair to the authors to dismiss their contributions in such an offhand fashion, still it may be taken as a rough indication of the effort spent on the planet at a time when it was blazing in the sky like a beacon.

Can anything be done to remedy this deplorable state of affairs, which should wring the heart of every science-fiction addict? Two methods suggest themselves.

Scientific research goes more or less in cycles; perhaps "fashions" would be a better word. For years the astronomy of position held sway—the accurate determination of the positions of stars, planets, and comets. Then with the spectrograph astronomers became astrophysicists engaged in analyzing stellar atmospheres and identifying forbidden spectral lines. But the recent discovery of two interstellar planets revolving around double stars may swing the pendulum toward the sadly neglected visual binaries. Often a single remarkable case of this kind is sufficient to stimulate interest in a field.

How might this be done for Mars?

I would suggest the same method tried ten years ago on the Moon. At that time the Moon was in an even worse state than Mars is today. Not only was it utterly abandoned, but astronomers—especially astrophysicists—actively resented its presence in the sky. The Moon interfered with their long exposures on faint nebulae and star clusters and limited their work generally to less than half the month.

To keep selenography from becoming completely extinct, a Moon Committee was appointed, composed of experts from several branches of science. It was realized that astronomers alone lacked the background to tackle the Moon in its entirety, as it were. The study of a planet is a highly complex matter demanding workers in a wide variety of different subjects. Accordingly, the committee included four astrophysicists, one geophysicist, one mathematical physicist, and two geologists.

Within the comparatively brief lifetime of its existence, evidence as to the nature of the lunar soil was obtained which bears directly on the mystery of the craters. From the rapid cooling of the surface during an eclipse the astrophysicists were able to fix the rate at which the soil lost heat by radiation. From this the mathematical physicist showed that the soil must consist of light substances like volcanic ashes and pumice, but not massive rocks like limestone and granite. These results agreed with the preliminary data of the geophysicist on the quantity of polarization in moonlight compared with various minerals.

Without the active co-operation of these men, who in the ordinary course of events would never have heard of one another, these important facts regarding the Moon would never have been uncovered.

Is it futile to begin to map out a postwar plan for Mars at its next close opposition? Calculation shows it will come in September, 1956, and be a thirty-five-million-miler. By that time we must be ready to assault the Red Planet with a high-powered battery of astrophysicists, electronic engineers, chemists, mathematical physicists, geologists, photographers, and opticians. These men should be selected not only for their outstanding reputations, but for an open, flexible attitude of mind, as well as a demonstrated ability to work with others easily and without jealousy or constraint. There should be the closest co-operation among them so that the expert knowledge of one is always at the disposal of the others. In a motion-picture studio every person whose services might conceivably be required is kept on the set continually and may leave only with the director's permission. An individual may be called upon but once during the entire day—or not at all—but should the need arise he is instantly available.

Furthermore, the first assault should be launched from the Southern Hemisphere. As already noted, when Mars is closest to the Earth it is always far south and therefore

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nearly out of reach by northern observatories. (In 1939 Dr. Slipher went from the Lowell Observatory in Arizona to Bloemfontein, South Africa, to photograph Mars at opposition.)

As an example of how combined operations by such an expert general staff might function, let us consider the problem of the nature of the blue-green areas.

We all know that these change tint with the seasons, being some shade of green most of the year but variously described as a dirty or chocolate brown during the winter and early spring of Mars. The changes observed are so typical of terrestrial vegetation that we are forced to conclude there must be at least some sort of plant life on Mars.

But what kind of plant life? What kind of flora is it that can thrive in an atmosphere thinner than the thinnest mountain air, probably devoid of oxygen, where the temperature falls below freezing every night? Is it fundamentally like that on Earth in being composed of chlorophyll? Or is it composed of some entirely strange substance of which we have no knowledge whatever?

At first glance it might seem that to get even so much as a clue would be beyond our reach. If only the sunlight from these regions by some fantastic process could be imagined as going *through* the vegetation, then we might feel fairly optimistic. For if sunlight is sent through a tank of water full of crushed leaves and grass—chlorophyll—and the translitted beam examined with the spectroscope, there will be found dark lines in the blue and green and a strong band in the red that are characteristic of chlorophyll. These lines and bands enable it to be identified immediately *provided we can get a look at its spectrum by transmitted light.* Unfortunately, there is no reason for believing *a priori* that sunlight from Mars has passed through any such vegetable absorbing layer.

But we have another string to our bow. Chlorophyll does not reflect all colors equally well. This is strikingly shown on landscapes photographed through a deep-red filter, which always makes green foliage an unnatural white due to overexposure. By comparing the spectrum of sunlight reflected from distant vegetation with that from the blue-green regions, we might get an indication of whether chlorophyll is present there. The comparison is far from easy, however, for the reflection spectrum of chlorophyll is not nearly so definite as its absorption spectrum.

In choosing our task force, we would naturally pick astrophysicists who are old hands at making radiation measurements with the thermocouple and photo cell, or in photographic photometry, to get the observational data. A physicist would be called into consultation who has experimented with the effect of light on dyes and pigments. An organic chemist might also make a contribution here. The results of their analysis would be turned over to a botanist or biochemist for final interpretation in terms of vegetable life on Mars.

A few comparisons between the blue-green regions and terrestrial vegetation have already been made, so far with negative results. (This article gives scant encouragement to readers who would like to have strong evidence for the abundant life on Mars.) But the matter can certainly not be regarded as settled as yet, and an intensive investigation such as postulated here would undoubtedly result in more delicate methods of comparison than those applied to date.

Another scheme that should be tried is the one applied to the Sun beginning in 1932. Events often transpire with extreme rapidity on the solar surface. Brilliant eruptions occur in sunspots that paralyze high-frequency radio transmission for hours at a time. These eruptions may rise to maximum in less than ten minutes in many cases. Getting the complete life history of one is largely a matter of luck, like happening to look in the right direction when a bolide falls.

In order to get more extensive solar observations, a string of cooperating observatories was organized extending around the globe. Each observatory, depending upon its longitude, was assigned an hour when it was to keep the Sun under constant observation. (Of course, you could look longer than an hour if you wanted to.) The

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program was planned so that the hours overlapped slightly; for example, Mount Wilson observed from 2:00 to 3:00, then Apia, Samoa, began, followed by Wellington, New Zealand, and Canberra, Australia. Each observatory sent its results to Meudon, France, where the material was combined and published for the benefit of all. In this way the Sun was never out of sight and no event went unnoticed on its Earthward surface owing to the eternal vigilance of alert observers from Pomona, California, to Nanking, China.

Now there is ample evidence that events transpire upon the surface of Mars with the same speed as upon the Sun. Moreover, these events are of the utmost significance in furnishing information regarding the nature and meteorology of the planet's atmosphere. Often more can be learned from one such observation of this kind than ten years of routine watching. Witness the projection which Slipher and Lowell caught upon the sunrise terminator of Mars in 1903. From micrometer measures of its length and its tawny color they interpreted it as a dust cloud seventeen miles high similar to the vast dust storms that sweep over our own deserts. Or again, take Slipher's photographs in blue light revealing a sudden increase in transparency of the Martian air during May, 1937, so that the surface showed as distinctly as through a yellow filter.

A chain of stations in both hemispheres extending around the Earth, pledged to keep Mars under observation for two months before and after opposition, should not merely be of the greatest aid in supplementing those institutions devoted one hundred percent to Mars, but would probably do much to stimulate interest in this forgotten world. Even if the entire effort resulted in a single notable observation the program would have justified itself.

But when all is said and done, Mars is far away and our instruments relatively feeble. The very closest approach possible is for opposition to occur when Mars is at the perihelion of its orbit when the Earth is at aphelion. At this supremely favorable or super-opposition the distance between the worlds will be narrowed down to 33,883,000 miles. The perturbations of the orbits grind so exceeding slow that this situation will not arise until around the neighborhood of 278,224 A. D. Whether optics, electronics, or whatever they will have at that time can bridge this gulf so that we may scan Mars with the same ease that aërial mapping is done today, seems doubtful. By that time, however, purely astronomical means of planetary exploration will probably be as obsolete as the mural quadrant.

For there is just one sure way to settle the question of the canals for all time.

And that is to go to Mars and find out!

THE END.

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